THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE

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(J. A. BERLY'S).

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CYLINDER CONDENSATION.

OUR contemporary *The Engineer* recently published an article under the above heading, the object of which was apparently to throw cold water upon the heat-trap theory of the compound type of steam engine. According to this theory the multiplication of cylinders reduces the amount of condensation in each cylinder, because the steam in that cylinder passes through a more limited range of temperatures, and therefore the interactions between the steam and the cylinder metal are reduced, if not proportionately, at any rate, to an approximately proportionate degree. Taking into consideration also the reduced internal surface of the first cylinder, does it not seem rational to anticipate that less of the initial steam should condense? Not for a moment need it necessarily or consequently be claimed that the efficiency of the compound or of the triple-expansion engine will be better than that of engines with a less number of cylinders. There may be differences of construction and other matters that will reverse the order of economy with regard to the brake horse-power. But for suitable steam pressures, efficiency calculated on the indicated horse-power will usually be better when the number of cylinders in series is increased, though the commercial efficiency may not always be improved.

But our contemporary appears to argue on a somewhat curious basis in regard to the question of percentage condensation. A triple-expansion engine is referred to which shows a condensation in the H.P. cylinder of 15 per cent., in the intermediate cylinder of 12 per cent., and in the L.P. cylinder of 8 per cent.; these three percentages are added together to show a total condensation of 35 per cent., and this is set down as a bad argument for the heat-trap theory. To our way of thinking, this method of reasoning is not correct. The three percentages must not be added together as though they were cumulative; for they are not cumulative. Each cylinder condenses a certain proportion of the initial steam to water, and reconverts the water to steam before it delivers it to the next following cylinder. The condensation of a given percentage of steam in a cylinder may be said to reduce the amount of work done in that cylinder by approximately that percentage. Now, if the work done in each cylinder is one-third of the whole work, then, in the case cited, the first cylinder fell short of full duty by 15 per cent. of one-third of the work; the second cylinder in turn failed to perform 12 per cent. of one-third the total work, while the third cylinder failed to the extent of 8 per cent. of one-third. The three cylinders thus failed to the total extent of 35 per cent. of one-third of the work, or barely 12 per cent. of all the work. The average cylinder condensation was not even 12 per cent. when properly accounted for.

The cylinders do not absorb the water ; they pass it forward as steam. Indeed, we seem to remember our contemporary long ago pointing out this fact, and stating that if the cylinders did not send out their contents as steam, they would begin to accumulate heat. Now this never occurs. The cylinders do not become hotter, yet they only lose heat by radiation and by work. They must, therefore, not be accused of accumulating latent heat. Yet that is what they are accused of doing when the percentages of condensation are added together, as done by the *Engineer*.

Arguing on these lines, condensation percentages of 22·9, 19·8 and 24·7 in another triple-expansion engine should not be represented as meaning only 1·8 per cent. condensation in the L.P. cylinder. Yet that is what is done, and it appears to us that an equally false argument is set up in the opposite direction. Here by calling the condensation the missing quantity, the L.P. cylinder is declared guilty of only 24·7 — 22·9 = 1·8 per cent. of condensation, whereas, as a fact, apart from jacket drainage, it received as much steam as did the first cylinder and condensed 24·7 per cent. of it, whilst the middle cylinder condensed only 19·8 per cent. of what it received. And in each case here the percentages condensed are really represented by such a percentage of a third of the work.

Our contemporary is very ambiguous in this article. While at one point itself adding up successive cylinder condensation percentages in the cumulative manner above referred to, it chides a Mr. Hide for having apparently done the same thing. We must, however, fully agree with the *Engineer* that the missing quantity is to be accounted for by cylinder condensation, and that the theory of Messrs. Callendar and Nicolson, so much advertised by Mr. Mellanby, is indeed very far from being accepted either by engineers or physicists. It is singular that such a big theory could be constructed on such meagre foundations.

Franco-British. THE great Franco-British Exhibition ought *not* to have been opened to the public on Thursday last week. The other day in our hearing somebody of an alliterative turn of mind, speaking particularly of the Exhibition as seen on the opening day, called it a miserable mess of mud, muddle and mismanagement. Perhaps it will be better if we do not attempt to express our own feelings in print, for as we were not asked to go it was our own fault that we were there. Much might have been forgiven had the elements comported themselves with anything like reasonableness, but after standing chilled to the bone awaiting admission long after the announced hour of opening, we waded in a drenching downpour along well-flooded and newly-made or half-made pathways to the Machinery Hall in the hope that among more congenial surroundings and kindred spirits we might find something to interest us. It is a big Hall—we do not dispute that for a moment, and when things are ready for an engineer to see, it may be an interesting place for our readers to go to. True, there were a few completed exhibits, but we have a lively recollection of one poor disconsolate friend standing in the middle of an array of half-readiness which represented the exhibit of one of our largest manufacturing firms in the Manchester district—we were glad to notice on Wednesday last that he has since been enabled to get a little forrader, but his unfortunate experience we are afraid is all too typical of the state of things as we then saw them. Of course, much has happened in the week that has elapsed since then—but that much ought, we should say, with proper management, to have been possible before the doors of any part of the Show were thrown open to the public.

It was stated at the L.C.C. meeting this week that the Committee, which has power in such matters, withheld its consent for opening right up to the Thursday morning, owing to the extremely backward state of affairs on Wednesday night. It was only because an enormous amount of work was done during the night that it was at all possible to pass the place as sufficiently safe for opening on Thursday.

As to the belated Electric Supply Exhibit, part of the suite of rooms had been put up, and we trust that every effort will be made to get it speedily into something like a finished state. In later issues we shall have something to put before our readers concerning such of the Machinery Hall exhibits as are of interest to electrical men, and concerning the electrical installation and illumination arrangements of the Exhibition itself, but we think that for the present it would be folly for an electrical engineer to take any considerable journey in expectation of making a profitable study of the engineering exhibits. There will be plenty of time for that later on. However, already anyone in need of an evening's entertainment with brilliant and effective electrical illuminations, firework displays, and so on, can find it there, and that, we suppose, is the *raison d'être* of the show with a hoped-for resultant cementing of the *Entente Cordiale*.

A Prophecy Fulfilled. THE decision of Mr. Justice Ridley in the case of Bourne and Hollingsworth *v.* Mayor, &c., of St. Marylebone, has been reversed on appeal, as will be observed from a report appearing on another page of this issue. When we dealt with the decision of the case, we ventured to express a doubt whether it would pass unchallenged in a higher court.

In view of the importance of the issues, it may be of interest to recapitulate the facts. By a provisional order duly confirmed, the defendant corporation were constituted the electric light authority for Marylebone, and were empowered to provide, sell, let for hire, alter and repair, &c., fittings for lighting and motive power, and were also authorised to enter into and carry into effect contracts for such purposes. If they made default in supplying energy to any owner or occupier of premises to whom they might be, or were, required to supply energy, they were to be liable to a penalty for each day on which any such default occurred. By a contract which was partly verbal and partly in writing, made between the plaintiffs and the defendants, the latter agreed to supply the plaintiffs' premises with electric light at a voltage of 240 by the first week of September, 1905, and on breach of that contract by the defendants they agreed to supply the plaintiffs with electric light at a voltage of 200 within two days of September 19th. Relying on the defendants' carrying out their contract to supply the 240-volt current by the first week in September, the plaintiffs made an installation suitable for that current ; and on breach by the defendants of the first contract, the plaintiffs, at the defendants' request, altered the installation to make it suitable for a voltage of 200, but the current was not supplied till October 3rd, whereby the plaintiffs suffered damage. The plaintiffs then brought an action for breach of contract, as a result of which the jury found that it was necessary that contracts such as had been entered into with the plaintiffs

should be made to carry into effect the purposes of the defendants as suppliers of electric light. Mr. Justice Ridley held that the contracts were binding on the defendants, though not made under seal; that they were not *ultra vires*, and that, as the action was founded on a breach of contract and not on a breach of a statutory obligation the defendants were liable in damages, and not to the statutory penalty. His judgment has now been reversed and a new trial ordered by the Court of Appeal, on the ground that even assuming there was an agreement between the engineers and the plaintiffs to make ready to supply within a limited time, the Corporation were not bound by the agreement. As we pointed out when dealing with Mr. Justice Ridley's judgment, it was largely based on the decision of the Court in Morris *v.* Loughborough Corporation (1908) 1 K.B. 205. In that case it was held that where a Corporation having the right to supply electricity, grant a supply on special terms to someone whom they are not bound to supply at all, they may, upon default, be sued for breach of contract, although in the ordinary way failure in supply to an ordinary consumer can only be punished by fine. That decision has really no application to the case under review, as the Marylebone Corporation were under statutory obligation to supply Messrs. Bourne & Hollingsworth.

Municipal Electricity Economies.

Feeling that it was incumbent upon them to do something radical to make their electric light undertaking pay, the Swansea Corporation hit upon the simple, though apparently parsimonious, method of expending less on the salaries account of the electricity department, the wisdom of which, from an outsider's point of view, is certainly open to criticism. From the reports that have appeared in the local Press, it seems that, taking advantage of the resignation of the chief assistant engineer, who was in receipt of a salary of £200 per annum, no new appointment is to be made, but the present senior shift engineer and the present mains assistant are to receive advances in salary to a total of £2 10s. each per week, and to divide the extra work between them, this arrangement bringing about a net saving to the Corporation of £140 per annum. Further, the Council has also dispensed with the services of its draughtsman recently, thus securing another reduction in the salaries account.

A further reduction in expenditure is brought about by not insuring the engines at the generating station. The reasons put forward by the Chairman of the Electricity Committee to explain this omission were, first, that the machinery was of such a high class that there was very little risk, and secondly, that the charges for insurance would be very high. High insurance and little risk are not usually associated, so that there must be some error in the statements.

These economies, to say the least, are somewhat peculiar, and seem to indicate either that the undertaking has hitherto been overstaffed, or else that it is now going to be operated either by a staff that will be overworked and inadequately remunerated, or by a staff that is prepared to attempt the extra work for the sake of the experience to be gained.

Economies of this sort, while perhaps benefiting the undertaking momentarily, are of the class that should be avoided, as ultimately they must react against the true progress of municipal electrical departments, upon which depends the success of a large section of the electrical industry. Responsible positions should not be held except by experienced men, and such men cannot be obtained for salaries which are less than the wage of a working foreman.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Charging for Electrical Energy.

We welcome the comments of your correspondent Mr. Henry Joseph, which appear in your issue of last week, and should feel appreciative if you could spare us a small portion of your valuable space in which to reply.

We fear that the fact that metallic-filament lamps and the proposed method of charging were discussed in the same paper has led to some confusion. The arguments put forward as regards the latter would, to our mind, apply just as much if the metallic-filament lamp did not exist. The necessity for reconsideration of the present methods of charging is merely emphasised by the introduction of metallic-filament lamps—nothing more.

Some consumers at present do not pay sufficient for the facilities placed at their disposal, while others pay too much. Surely your correspondent does not wish to contend that this is equitable! Moreover, it handicaps electricity in its competition with gas.

We have no objection to the consumer adding up his bill at the end of the year and dividing it by the number of units that he has consumed; it will show the profitable consumer that he is paying considerably less than he did before, which in turn will bring many more consumers of exactly the nature that the station wants.

In our opinion, it is the total of his bill at the end of the year that causes the consumer to consider the price per unit that he is paying, and if he knows beforehand, within a small amount (as is the case with the system we advocate), what this total is going to be, he has very little ground for complaint.

Turning next to the question of metallic filaments: those stations who find that their output is not affected, and are yielding paying returns on the capital invested, have, of course, no need to trouble themselves. We do not wish in any case to increase the total cost of electric lighting to the consumer, but we do say that, in the case of stations which find their profit-earning capacity reduced by the introduction of the "wire" filament, there is ample margin, owing to the economy of the new lamp, for the electric light undertaking to increase its price per unit, thus enabling it to share in the advantages that accrue to the consumers, the lamp-makers, the wiring contractors—in fact, everybody else except the supply stations, although the latter, in the aggregate, represent more capital than all the rest put together.

Possibly the "shunt" or "resistance" lamp, as shown by Mr. Stearn at the meeting, has been overlooked by your correspondent, as the extent to which it is being adopted for electroliers, shop lighting, and similar positions, and by consumers who require an 8-C.P. or 16-C.P. unit on a direct-current circuit, indicates that the consumers on a station with a supply of this nature are just as anxious to effect economies as those on alternating stations, now that they are in a position to do so.

Handcock & Dykes.

London, S.W., *May 12th*, 1908.

City and Guilds Examinations.

Now that the C. and G. examinations in electrical engineering are concluded, it may not be out of place to make one or two remarks on the questions set in the honours grade.

1. The regulations say that all candidates must be attending a recognised course of instruction. Are the questions set such as those in which an evening student would receive instruction? It is to be noted that by far the larger number of candidates are *evening* students.

2. The choice of questions is much too little when the range of the subject is considered, and gives a candidate not much chance of showing his ability.

3. Engineering apprentices who are unable to attend a technical institute in their locality, owing to the absence of such an institute, are debarred from the examination.

4. As the examination now stands, it is quite feasible that really good practical students can never attain to first class honours.

H. U. W.

Are Consulting Engineers Necessary?

I have read with great interest a leading article in a contemporary on the need for consulting engineers. The article, in my opinion, sums up the pros and cons of the question in a masterly manner, the conclusion arrived at being that it is as much to the interests of the manufacturer as of the customer that a consulting engineer should be employed.

Two interesting letters have, in a subsequent issue, discussed the question raised in the article, and the suggestion is made by both writers that a list of properly qualified consulting engineers should be prepared by the Institution of Electrical Engineers. I consider this suggestion a most valuable one, and sincerely trust that the Institution may be induced to take action in the matter.

I should like to call attention to one aspect which has come specially under my notice.

At the present time most of the large electrical manufacturing firms have representatives at all the large centres, whose primary function is to push the sale of their firms' manufactures, but who very frequently undertake in addition to advise customers generally on electrical schemes.

I do not wish to make any reflection on the technical qualifications of these gentlemen, but am strongly of the opinion that it is not to the interests of the electrical industry, and certainly not to those of the client, that advice should be given by men whose sole aim is the sale of their firms' products, and who cannot in consequence give an unbiased opinion.

M.I.E.E.

British Electrical Enterprise in Spain.

I note in your leading article last week comments on a report by Vice-Consul Jackson, of Madrid, on English electrical business in Spain.

Consul Jackson, being an Englishman, is—or, at any rate, was—the agent for a Belgian firm of electrical manufacturers, and it seems absurd that a man in his position should complain of his countrymen.

English electrical machinery is as good as, if not better than, Belgian, and the prices ruling in England are very low. If Consul Jackson wishes to help his countrymen, why import Belgian machinery?

The average British Consul is the last person to apply to for assistance with regard to engineering business; his main duties seem to be receiving stamp fees for witnessing documents, and at the ports, signing ships' papers.

Not merely are German Consuls expected actively to help their countrymen in trade matters, but in cases where public contracts or concessions are to be obtained, diplomatic pressure is brought to bear, and assistance is assured from all the local German financial houses.

An English Consul will not raise a finger in matters of this kind, and as for diplomatic assistance, the thing is unheard of. The modern English banker refuses to assist the manufacturer at home, so it is hardly likely that the English bankers' agents in foreign cities will assist in any way.

The average Englishman abroad or in the Colonies, having been brought up to the Free Trade gospel, looks upon the assistance of his countrymen as effeminate; it sounds so much grander to buy the latest American or German fad rather than the better-made English machine.

Where you find a German, you find him pushing German goods; but the modern Englishman thinks that every other country must be superior to his own in manufactures. You do not find German financiers, in Berlin, floating companies to buy English cabs or omnibuses or to take up concessions for the benefit of English manufacturers. All over the world, where you find German money, you find German machinery. Many years ago it used to be the same with us.

It is true that the terms of payment of the average English municipal contract are so stringent that manufacturers have to tie up thousands of pounds every year, whereas their Continental competitors, receiving 33 per cent. cash with order, in their home trade, and having the advantage of a protective tariff, can offer terms of payment on their export orders quite impossible with an English house.

Lately huge contracts have been placed in India for American electrical machinery by so-called English officials, under the practical conditions that "No English firm need apply." Any French, German or American Colonial official supporting an English firm in the way that so many of our people in Egypt, the Soudan, and the Crown Colonies support foreign firms, would be cashiered at once.

There are many cases on record where R.E. officers, men holding important engineering positions, have gone out of their way to condemn English manufactures, and assist Germans and Americans. There is the excuse in this case that one cannot expect an "amateur engineer" to tell the difference between foreign trash, as much of it is, and high class English machinery or rolling stock.

It is generally assumed that the English manufacturer is behindhand in his work and methods, but given the same assistance from his Government that the foreigner expects, and gets, the Englishman will come out top nearly every time.

One cannot expect to do much nowadays, when the hoisting of the Union Jack in front of an elementary school is forbidden in Parliament, as a "political emblem"; but some of us engineers hope to see the day when the business motto will be "Your Own Country First," and the active support of the foreigner against one's own countryman will be looked upon as bad form.

T. R.

Westminster, *May 16th*, 1908.

Placing Orders Abroad.

May I suggest to Mr. Green that, instead of introducing politics into a technical paper, he should study such questions in political papers, when he will find his questions very fully answered by both sides, and he can then take his choice.

It seems to me to be a great mistake to throw open your columns for the discussion of political questions, especially as the most dogmatic letters seem to proceed from the pens of people who can only be called the veriest tyros in politics.

If people wish to discuss such questions, let them write to political periodicals or the daily Press, and not occupy space in a technical paper that *should* be devoted to technical subjects.

T.

Wolverhampton, *May 18th*, 1908.

In his first letter Mr. J. I. Hall asked us to believe that because we exported to India some two millions odd in machinery during 1906-7, the Hull Corporation was under some sort of necessity to buy a German generator. Lest the proposition, in all its naked absurdity, should put too great a strain on our credulity, it was deduced from a general principle of foreign trade involving food, raw material and manufactured articles. His general principle I thought correct in substance, though somewhat too rigid in statement; but I denied, and gave reasons for denying, the validity of his deduction, whether as regards Hull in particular, or the import of electrical machinery in general. Mr. Hall brushes all this on one side, shelters himself behind "the school of economics in which I have been trained," and calls on me to prove that he is wrong and "that unrestricted trade is otherwise."

I submit, Sir, that I am under no obligation to prove that Mr. Hall is wrong; it is for him to make out his case. I do not know in what economic school Mr. Hall was trained, and therefore can form no opinion on it, save by the old criterion that a tree is known by its fruits. Nor can I take up his challenge to prove that unrestricted trade is otherwise; first, because I do not understand what it means, and, secondly, because we have never had unrestricted trade.

Lastly, I am called on, under penalty of being supposed to know nothing about the subject, to put my views clearly and concisely—presumably also gratuitously—before your commercial readers. I fear that I must decline this invita-

tion also. I do not claim to have made any discovery in economic science to justify my inflicting my views on your readers; my interest in that science is that of a layman. Moreover, I cannot pretend to Mr. Hall's faculty for putting a large and complicated subject in a nutshell. Even were I ready to embrace the opportunity, I doubt whether it would be offered me. My experience is that, on these subjects, there are many teachers and few learners. Every one is ready to talk about them, no one to listen.

W. M. M.

P.S.—With Mr. Hall's reply to Mr. Fawcett I am not concerned, but his reference to foreign investments suggests one outlet for the superfluous cash with which he credits us, as an alternative to the purchase of foreign machinery.

Mr. Hall's letter in your last issue opens up a number of debatable points, and is doubtless, as he says, a correct exposition of our unsatisfactory trading system at the present time. The fact that foreign nations send us what we require and ask for is, however, somewhat beside the point, as it may be argued that we demand goods from abroad which could, and would be, equally well made here, given suitable conditions; or to put it plainly, our requirements are influenced by the present Free Trade arrangements in such a way as to give preference to manufactured articles, rather than raw materials, and with serious disadvantage to the home worker. Perhaps Mr. Hall will give his reason for assuming, as he evidently does, that the proportions of raw and manufactured goods demanded by us, and imported into Britain, must remain rigidly fixed.

Assuming that we could increase the proportion of our raw imports, and correspondingly of our manufactured exports, can Mr. Hall deny that the home worker would benefit? Does it not occur to him that some of the British capital invested in foreign securities, about which he is so solicitous, might then be re-invested in this country, with equal or greater advantage to the investor?

It would also be interesting to hear Mr. Hall's reason for the migration of British capital to support foreign industries. Can he deny that many of the latter consist of off-shoots of British parentage, which have come into existence solely because the parent concern found it impossible otherwise to get over the tariff wall of the country with which it was anxious to trade? Can he show that Britain and its workers benefit equally well, whether the factories be on foreign soil or in this country? For in this country they might have been, had we had the chance of retaliating, tariff for tariff, as is evidenced by the effect of our slightly protective Patent Law.

Mr. Hall makes such a strong point of the security of our foreign investments, many of them industrial, and the bulk of them owing their security, either directly or indirectly, to the very tariff walls which he so much abhors, that one wonders he does not feel tempted to apply some of the conditions producing this security to his own country. But no, Mr. Hall's remarks force one to the belief that he dreams of a modern Utopia, inhabited solely by investors in foreign securities and their domestic appendages—far, far, from the dirty factory and its workers, these being supposedly transferred to foreign soil, and run by the happy Utopian investor. A sort of Continental suburb, with a few banks thrown in, for obvious reasons. A colony of monied nonentities, with no other concern than the security of their investments. What an ideal for a nation!

A.

Wolfram Lamps in Germany.—The shareholders in the Wolfram Lampen Gesellschaft, of Augsburg, which has hitherto devoted itself to the utilisation of the patents associated with this name, have now sanctioned the increase in the capital, from £42,500 to £150,000, to which reference was recently made in this journal. Out of the total augmentation, shares representing £32,000 have been allotted to the firm of G. Ludecke for the acquisition of the latter's lamp factory at Augsburg-Lechhausen, whilst the balance has been taken over by a syndicate at the rate of 125 per cent. The Wolfram Gesellschaft thus becomes a manufacturing company with a market already assured for its products.

PARLIAMENTARY.

London and District Electric Supply Bill.

(*Continued from page* 814.)

MONDAY, MAY 11TH.

ON Monday, May 11th, SIR RALPH LITTLER, K.C., who appeared for the City Corporation, explained that the position of his clients was that they objected to their inclusion in any Bill.

The CHAIRMAN (Lord Cromer) said he wished to bring forward a matter which the Committee considered of some importance, and he did not press counsel for an immediate answer. What they would like to know was as to what would happen in the event of anything occurring to stop the Barking supply. He was assuming that the distributing companies were taking their supply from Barking. What was in his mind was this. They had heard that there might be several installations which would be quite independent of each other, and that if one went wrong, the other would work. He quite understood that, but this scarcely covered the whole field of the inquiry. What he had in his mind was some more general cause, either internal or external, which would stop the whole of the supply. Suppose they were engaged in a war and the mouth of the Thames was left temporarily unguarded. He did not know how far as an operation of naval warfare it would be possible for a foreign warship to shell the Barking station. He would like to know whether in such an event the whole supply of the district would be cut off, or whether there would be some means of making a temporary arrangement to mitigate the evil. In the same way what would happen in the case of a strike? He believed there was some special provision in one of the Criminal Law Acts, making it a criminal offence to make any combination which would cut off the supply of a town. There was also the possibility of local disturbance. If an Anarchist put a bomb into the station, would that entirely stop the supply to London?

MR. FITZGERALD said he could answer the questions at once. In a large generating station of this kind they had a number of units, and the destruction of one unit did not affect the others. He believed the figure which Mr. Parshall gave was 24,000 KW. for each unit. In a large station of that kind they would have half a dozen units, and supposing that one was destroyed or went wrong the supply would go on from another. That was the method by which any ordinary contingency of machinery breaking down, or anything of that kind, was provided against. If, however, his lordship went further and dealt with ships of war coming up the Thames and taking possession of the generating station, he was afraid that they could stop the work.

The CHAIRMAN: Would the whole of London be deprived of light and power?

MR. FITZGERALD said he supposed it would, but inasmuch as generating stations were required to be in a place where they could get plenty of coal and water, if the hypothetical ship of war destroyed one station it would destroy others. It did not seem to him that the proposition to have two generating stations, one on either side of the river, would alter that state of things. The same answer also applied to disturbances by Anarchists. If they were able by means of bombs to destroy one generating station they would be able to destroy another. Again, in the case of a strike it would be equally a strike whether there were one, two or three generating stations. As a matter of fact, the number of men employed in a generating station was not very large. It was not like a great factory. He could not himself see that it made any difference whether there were one or more stations.

MR. BALFOUR BROWNE said that New York and Berlin did not rely on one station. With regard to strikes they knew distinctly that when there was a strike in the works of the South Metropolitan Co. there was no strike amongst the workmen of the other two gas companies.

MR. FITZGERALD: They were different companies.

MR. BALFOUR BROWNE said there were also different electric lighting companies. The Criminal Law as to strikes applied to gas and water but not to electricity.

MR. PARSHALL said Mr. Browne was wrong as regarded New York.

WITNESS said, cross-examined by SIR R. LITTLER, the City was part of their scheme, although they could carry it on without going through the City. He understood that the City Corporation had the right to purchase in 1914, but he did not know that if the scheme were carried, and his company purchased one of the companies supplying the City, the right of purchase would be postponed for 42 years. A canvass had been made of the City, and the power consumers were comparatively numerous. There were, however, no big power-users in the City.

Cross-examined by MR. BALFOUR BROWNE (on behalf of the existing electric lighting companies) WITNESS said he had taken the eight large companies, and assuming that they were linked up he took it that it would cost them as much to do what the promoters intended as it would the promoters.

Assuming the eight companies linked up, how much would the cost be according to you?—Assuming that it would be done in the proper way, you would not be able to do it under about £40 a kilowatt for linking up and putting in the generating plant necessary.

We were talking about linking up?—But if you use the station for supply, you must have the same plant.

Continuing, WITNESS said the existing companies might save something on buildings as compared with the promoters, although

he was not satisfied that they had proper buildings. It might be that the existing companies would have a small advantage in regard to land and buildings. If the eight companies linked up they could not get their plant so cheaply as the promoters unless they used the same units. The £20,000,000 which had been spent by the local authorities and companies was not all spent on generation.

But you are going to put £6,000,000 on the back of that, and yet you say it is going to be done cheaper?—We are not putting £6,000,000 on the back of that. We are going to spend £1,500,000 on doing what you spent £9,000,000 on.

Cross-examined further as to the grounds on which he based his estimate that between 200,000 to 300,000 KW. would be required for industrial purposes, WITNESS said he had personally visited about 12 factories. Messrs. Bryant & May's had 200 H.P. installed, and the joinery works of Messrs. Maple about 300 H.P. At present the latter company had its own electric plant installed, but they were coming to say that they would be a customer. He considered the estimate made was a moderate one. He did not agree that anything which the promoters could do could be done equally well by the existing companies. The average amount of power which it was estimated would be required was 30 H.P. per factory.

Mr. Merz's estimate was 50 H.P.?—I am not answerable for that.

Replying further to questions on the promoters, WITNESS said the promotion was in the hands of Mr. Owen Hugh Smith, who was a great personal friend of his own. He did not know who was in the syndicate. When the London County Council Bill was thrown out, several gentlemen, including a number of Members of Parliament, came together for the promotion of the Bill. His instructions came partly from Messrs. Sherwood and partly from Mr. Smith.

Is it not the fact that, after the Bill was thrown out, you and several persons together hatched this?—It is not hatched yet.

Continuing, WITNESS said that Chicago used to be served by a number of companies, but there was an amalgamation and a supply from a central station, and the cost to the consumer had been less. In New York the railways and tramways were served from separate stations, but each one was on its own individual station. He was in Berlin during the strike. There they had two stations, but if either had failed, the supply would have stopped, as the other could not have taken the increased load. He considered that their company was stronger than that of Mr. Merz. Although the Administrative Co. had agreements with six companies and three local authorities, his company had not got one. According to the last Board of Trade returns, the number of units sold for power and heating was 66,287,518, producing a revenue of £385,000, showing an average price of 1·386d. per unit; private lighting, 125,930,170 units sold, revenue £1,980,000, and the average price 3·777d. per unit; public lighting, 20,956,591 units, the revenue £155,000, at an average price per unit of 1·802d. The result of these figures was an average price per unit of 2·839d. for all purposes. He accepted the figures of counsel that that showed a small drop to 2·5 from 2·839d., although his company showed in their tables that they could effect a saving of £224,000. Witness was questioned at length as to the estimate of carrying out the work, but would not admit that the figures were wrong. Railway companies would send representatives to say that they would take a supply. He did not know that 30 Power Bills had been passed, and that not one of them, unless it had been connected with a distributing company, had paid a dividend except the North Metropolitan Power Co. Neither was he aware that five of these companies had not done a stroke at all. He did not think it was easy to raise money for electrical schemes.

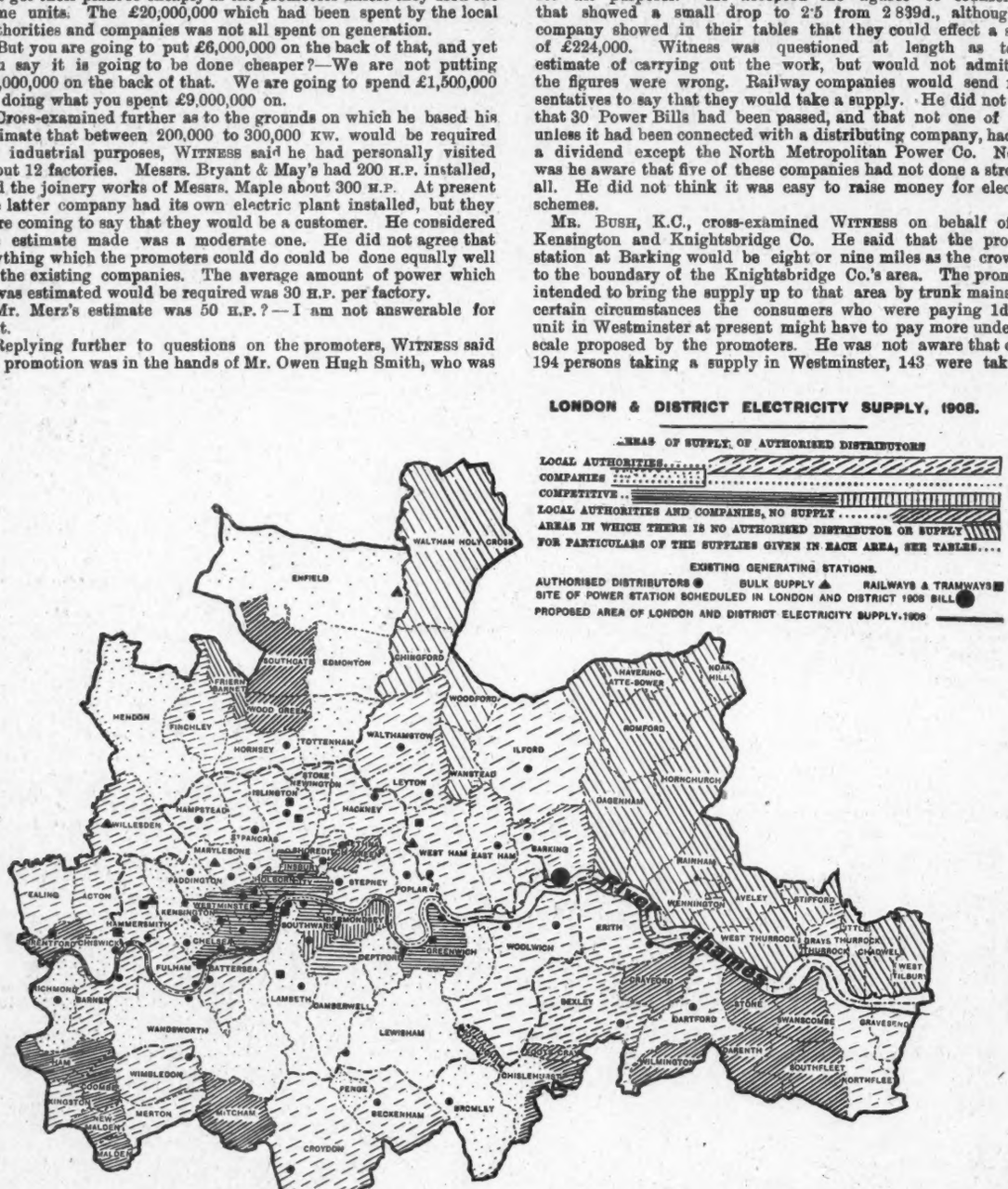
MR. BUSH, K.C., cross-examined WITNESS on behalf of the Kensington and Knightsbridge Co. He said that the proposed station at Barking would be eight or nine miles as the crow flies to the boundary of the Knightsbridge Co.'s area. The promoters intended to bring the supply up to that area by trunk mains. In certain circumstances the consumers who were paying 1d. per unit in Westminster at present might have to pay more under the scale proposed by the promoters. He was not aware that out of 194 persons taking a supply in Westminster, 143 were taking a supply from counsel's clients. They had got power under their Bill to supply individuals and companies direct without the consent of authorised distributors. He did not know of any other Power Bill which had such power. If the authorised distributors refused to take a supply, the promoters would use the other powers in their Bill. They had power under the Bill to lay down a competitive set of mains for public lighting.

Replying to MR. ERSKINE POLLOCK, K.C., (Middlesex County Council) MR. PARSHALL said that he was aware that the whole of the area in Middlesex proposed to be supplied by the promoters was already supplied in one way or another by two existing bulk companies. The trams were already supplied. He was responsible, along with his engineering colleagues, for the area proposed to be supplied. They objected to striking out Middlesex.

MR. FITZGERALD pointed out that Middlesex was not at present actually supplied by his companies—the companies had the powers.

MR. POLLOCK, K.C., maintained that the tables of the promoters showed that Middlesex was already supplied.

MR. FREEMAN, K.C., for the L.C.C., questioned witness at length on the clauses of the Bill. Counsel pointed out that the view of the L.C.C. as to the "Kitson Clause" was not as witness had said "not acceptable to them." The purchase clause in the pro-



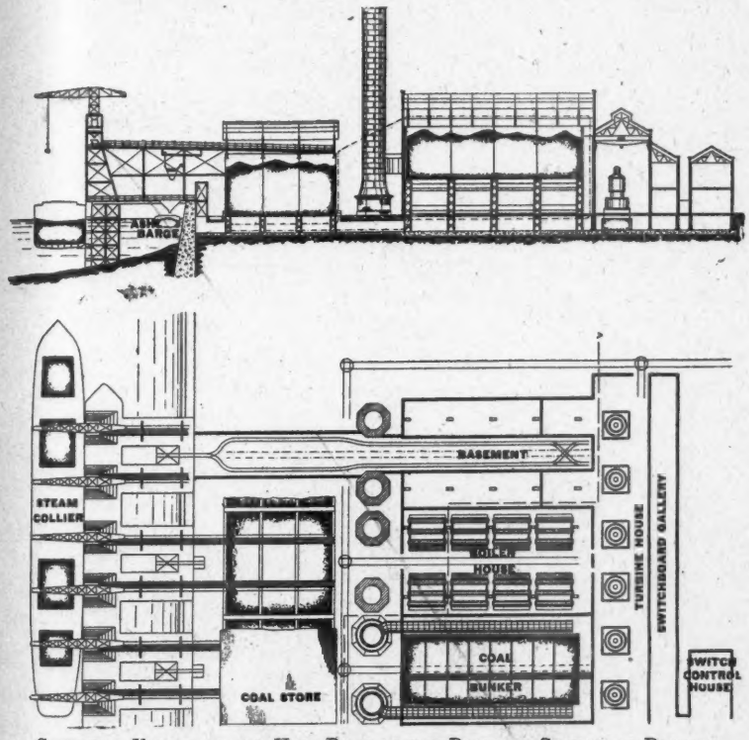
moters' Bill was not in the Administrative Bill. The last-named Bill provided for the purchase under the Electric Lighting Act. Counsel questioned Mr. Parshall at length as to the purchase clause, and he admitted that there was no provision in the Bill for the promoters to keep the plant up-to-date. He did not see any reason, excepting the point as to the then value, why in 1931 if anybody should want to take over all the electric companies, the undertaking should not be acquired under the Electric Lighting Acts provisions together with the amount of goodwill which would be represented by the difference in the business being acquired in 1931 instead of at the end of 42 years, as at present proposed by the promoters.

A discussion arose between Mr. Fitzgerald and Mr. Freeman and Lord Welby as to the meaning of money "properly expended on capital expenditure."

Mr. Fitzgerald submitted that the auditors would see how the money had been expended.

Mr. Freeman said that they wanted to be assured that they would not have to pay money for machinery which was "properly expended" at the time of the installation of the plant, but which in course of time had become obsolete.

Mr. Fitzgerald, K.C., said that no purchase clause was inserted in other Power Bills, but a strong opinion was expressed at the time of the consideration of the Administrative Bill, that any Bill dealing with London should have a purchase clause inserted. If the promoters' Bill was an ordinary one, they would have no possible objection to an ordinary clause. If they were to be purchased under the Electric Lighting Act there might be considerable difficulty in raising the capital. Considering that electric lighting companies were not restricted as to the limit of their capital, the promoters thought that they should be placed in a better position, and accordingly they proposed that the capital should be repaid, but no account taken of the profits. Supposing £5,000,000 had been spent, and they were paying 10 per cent. at the end of 42 years, the body that acquired them then would have an admirable purchase. They were not departing from any rule whatever. As it was, they were making a concession which had never been made in any Power Bill. With regard to the Administrative Bill, that measure as introduced into Parliament contained no purchase clause; it was brought in as an ordinary Power Bill. It passed Lord Camperdown's Committee, and it was not until it went to the House of Commons, where it was opposed on second reading, that a member, who was authorised to speak on behalf of the promoters, agreed to insert a purchase clause. That again was a clause not the same as the Electric Lighting Acts, and not the same as proposed by the promoters.



Sectional Elevation and Half-Plan of the Proposed Station at Barking.

Mr. Freeman said that a clause was brought up by the Administrative Co. and objected to by the L.C.C., and it was on their objection that the clause as passed was inserted. All the L.C.C. now asked was that a similar clause, which was fully discussed before Parliament in the case of the Administrative Bill, should be inserted in the promoters' Bill.

Tuesday, May 12th.

On May 12th, Mr. Fitzgerald said he would like to explain how Mr. Parshall based his estimates as to the amount of power likely to be required. That gentleman obtained his information from the Board of Trade returns as to the number of people employed in factories and workshops, and based his calculations on those returns. He also had the benefit of information which he obtained when he was called in as engineer to the L.C.C., when they promoted their Bill last year, supplemented by further inquiries.

Mr. Freeman continued his cross-examination of Mr. Parshall. Witness admitted that the effect of Clause 64, which provided that one-third of the surplus profits after paying the maximum dividend of 8 per cent. could be applied to the formation of a sinking fund, another third to the reduction in the cost of electrical energy, and the remaining third to increasing the dividend, would be to benefit the purchasers at the end of 42 years. He knew there was a clause in the Administrative Co.'s Bill which established a sliding scale and enabled the promoters to increase their dividend as they reduced the cost of electrical energy. They proposed to take these cables through the Rotherhithe Tunnel, and would require about 2 ft. square space.

Mr. Wedderburn, K.C., examined Witness for the Corporation of Croydon, who agreed with counsel that under the Bill the two alternatives for the Corporation were to "scrap" their plant and take a supply from the promoters, or work in combination. "Scrapping" would be best for the company, and the working in combination was best for the Corporation according to the tables put in by the promoters. He knew that in Power Bills a clause was inserted providing that the powers granted under the measures should cease unless a certain proportion of the capital was raised within a given time. He did not think the promoters would object to inserting a similar clause.

Replying to Mr. Blennerhassett, K.C., who appeared for the Westminster City Council, Witness said he knew that there were seven companies at present supplying the Council's area. The area was more of a residential than an industrial character, and he agreed that a demand for power was a most valuable adjunct to an electrical company and an aid to its success. They had power in the Bill to acquire existing undertakings without the consent of the local authority.

Are you willing to agree that you shall not go behind the backs of the Council to purchase an undertaking without the consent of the Council?

Mr. Fitzgerald (interposing): No, I can't agree to that.

In answer to Mr. Morton, counsel for West Ham Corporation, Witness said there was nothing in their Bill to prevent them charging low rates in order to get customers, and when they had got them raising them. He knew there were several customers in West Ham whose maximum demand exceeded 250 kw. He should say that West Ham was in a very good position to supply current for power purposes.

Mr. Cane cross-examined Mr. Parshall for the St. Marylebone Borough Council. Witness said it was very likely that the effect of the promoters competing with the Council would be that they would only leave the local authority the supply for lighting. The promoters' justification for competition was that they could supply the current cheaper. He admitted that the Marylebone Council's capital cost—£21·9 per kw.—was considerably less than the promoters' would be, taking into consideration generating plant, mains, cables, &c. Counsel pointed out to witness that according to the promoters' tables saving of £3,435 would be effected to the Council. They had evidently taken the figures from the last available return which showed that the generating cost was £34,970 including £28,870 for working expenses. The Council had, however, effected a saving of £5,000 on their working expenses during the last year on the figures which the promoters had put in, so that that £5,000 saving entirely wiped out the £3,435 which his company said they would benefit by.

In answer to Mr. Courthorpe Munroe, who appeared for St. Pancras Borough Council, Witness said he accepted counsel's statement that that was the pioneer local authority to start with electricity, as they got their order in 1882, and they had over half a million of money invested in the concern. He had never heard of any complaints from consumers, and he knew that no-one had been allowed to come into St. Pancras and enter into competition with the Council. He was surprised to hear that there were only three power-users in that district who used over 250 kw. He did not know that the local authority supplied 5 per cent. of the power users in St. Pancras. Counsel instanced a case of a firm of contractors, who asked the Council to supply them with power at Mr. Merz's price, and not the Council's 1d. flat rate, and they were surprised to find that, although they worked an eight-hours' shift day and night, the charge worked out at 1·9d. per unit. Counsel therefore submitted that the consumers would not benefit to the extent they thought they would.

Witness replied that counsel was only dealing with isolated cases.

In reply to a question of Lord Saunderson, Mr. Munroe said that he would prove to the Committee that, in the case of small consumers below the 250 kw., St. Pancras was charging, at present prices, less than the rates proposed by the promoters.

Mr. W. L. Williams (Stepney Borough Council) asked Witness whether the reason why they asked for five years to acquire the property of existing undertaking was because they doubted their financial stability, but Mr. Parshall said he did not think that was the reason. He accepted counsel's statement that nothing in their Bill compelled them to lay their cables as they stated they intended to do. Witness was aware that the promoters' charge was £4 10s. per KW. and ·33d. per unit, as against £3 per KW. and ·33d. per unit under the agreement which the Administrative Co. entered into with the Council. There was nothing in the Bill to compel the promoters to give notice that they intended to supply a consumer when the authorised distributor refused. Any irregularity in dealing with consumers could only be met on the part of the authorised distributor by their applying to the Courts.

Mr. Fitzgerald said that if the Stepney Borough Council handed in a clause on the Merz lines they would be prepared to consider it.

Mr. Parshall, in reply to Mr. Gerald Sanders, representing the Islington Borough Council, said they were bound to supply the Council with current at ·8d. per unit. If they purchased the local authority's undertaking they were entitled to the privileges under that authority's order. In that case they were able to charge 7d. per unit for lighting.

Wednesday, May 13th.

On Wednesday, Mr. Parshall was re-examined by Mr. Fitzgerald. He said that Clause 73 would enable the promoters by agreement with an authorised distributor, and with the consent of the Board of Trade, to take over any authorised undertakings, the right of the local authority remaining intact, and any such agreement would probably be in respect of an unprofitable undertaking. He did not think it was their intention to acquire profitable undertakings, for instance, such as those supplying Westminster. It would be seen by comparing the maximum prices in the promoters' Bill with other companies' maximum prices, that they were the lowest that had ever been put before Parliament. He thought the company would be glad to acquire undertakings on the same terms as applied to gas companies.

Mr. Robt. Hammond, who with Mr. Parshall is a consulting engineer to the promoters, was then called.

Replying to Mr. Clode, Witness said that in his opinion the system of supplying electricity at present was obsolete and too expensive. London was at present divided into various districts, and each of these places had generating stations, and he thought that with so many distributors there was no possibility of an economical supply. A large generating station operating on a large scale could do the work much more cheaply. What was wanted for London was a new modern station to deal with the whole of the area, just as the Niagara works generated electricity for a wide area around. The total capital expenditure spent on generation by the 26 local authorities was £3,133,818, and on distribution £5,064,092, a total of £8,197,910. The companies spent £6,365,508 on generation, and £6,987,730 on distribution, both figures amounting to £13,353,238. The total capital expenditure on the KW. for companies and local authorities was £99·6 and £89·2 respectively.

Dealing with the estimates of the promoters, Witness said that they considered the life of the buildings 60 years, plant 25 years, cables 30 years, and 10 years for meters. As to the prices to authorised undertakers, railways or canals, the maximum charge fixed in the Bill was for alternating current untransformed, £3 per KW. per annum plus ·25d. per unit; for transformed alternating current £3 10s. per KW. plus ·3d. per unit; and for those who desired a direct current £4 10s. per KW. plus ·33d. per unit. As an instance, Mr. Hammond gave the case of a railway company whose average use of the demand was 12 hours per day, or 4,380 hours per annum. The charge in that case per KW. would be £3. If that was spread over 4,380 hours, that would be equal to ·1643d. per hour, to which had to be added the charge per unit of ·25d. Thus the consumer would get the power for ·4143d. for one hour. The maximum load generated at the works would be 120,000 KW. They estimated that their expenditure would be £651,492. As to the revenue they apportioned the energy sold as follows:—To authorised distributors, £664,945; to power-users, £219,922; and to railways, £256,800, a total of £1,141,217, thus showing a profit of £489,788. In all they reckoned to sell 492,750,000 units. He considered that the clause requiring the consumer to take a certain supply when the current was laid on, was a reasonable one. For large power-users, the maximum prices in the schedule proposed by the company were for alternating current untransformed, £3 per KW., plus ·18d. per unit; transformed alternating current, £3 10s. per KW., plus ·2d. per unit; and for low pressure direct current, £4 10s. per KW., plus ·23d. per unit. The annual cost of generation at present incurred by authorised distributors was:—Local authorities, £515,605; and companies, £872,384; a total of £1,387,989. The total cost of a similar quantity of energy based on the maximum charges proposed by the promoters would be £747,917, thus showing an annual saving of £640,072. As, however, capital to the extent of £9,500,000 was already sunk in generating works, &c., London could not be given the full benefit of a cheaper supply until such time as the present plant was worn out. He would, however, point out that it would be unsound to go on adding to the generating plant in existing stations, and that all future supplies could be more economically drawn from a central station. To show that, the promoters estimated that under their scheme there would be a saving to the 26 existing local authorities possessing electrical plant of £56,385, and to the 13 companies £96,547, annually, if they closed down their works. Assuming that the local authorities, instead of extending their works, took a supply from the promoters, the saving would be £112,569—that was assuming that the local authorities took 123,164,148 units at a cost of £243,435. If, however, the local authorities increased their works to deal with the increased load, and that increase was 40,149 KW., the total working expenses would be £777,376. As to the companies if they, instead of extending the works, took their supplies from the promoters to an estimated extent of 135,925,000 units at a cost of £281,459, they would save £112,027. Should, however, the company extend their works to deal with an increased load of 39,994 KW., the cost would be £1,024,335.

Answering the Chairman, Mr. Hammond said that from figures he had obtained at present the horse-power connected up by local authorities was 40,000, and in the case of companies 42,000. Continuing, Witness said he thought that existing authorities were well able to supply small consumers. The clause in the Bill which gave power to the existing authorised distributor to charge 1 per cent. for every 10 KW. below 250 KW. was, he thought, a reasonable one. That clause was inserted so that a consumer could share in the benefits of the cheap supply given to the authorised distributor. The companies would get another benefit, inasmuch as supposing the total demand from small consumers was 1,000 KW., but that it was not all wanted at once, the company need not necessarily take 1,000 KW. from the promoters, and, therefore, the difference in the demand and the actual amount used was profit to the company. He did not see why the existing authorities should take up any hostile action towards the Bill. The promoters would be able to relieve the distributors from spending capital on generating plant—they could work in combination.

Monday, May 18th.

Mr. Hammond was further cross-examined on Monday. Questioned by Mr. Cripps, K.C., on behalf of the London Electric Supply Joint Committee Bill, as to what was included with the item generation, witness said he had only included the cost of the one central station—no sub-stations or trunk mains. In the case of the Charing Cross Co., he had allowed £48,700 for land and buildings, from which he deducted 20 per cent. for things not appertaining to generation; £38,477 for machinery; £64,022 for accumulators; tools £4,120; and roughly £570,000 for other items.

Counsel said that according to witness's tables they made a capital expenditure, in the case of the Charing Cross Co., of £929,000, but in point of fact it was only £624,000, practically £300,000 less.

Mr. Cripps then dealt with various figures in the tables, and on the basis that £300,000 had been calculated more than had been actually spent, and showed that they all differed from those which Mr. Hammond had put in.

Replying to the Chairman, Counsel said that he intended to call witnesses to prove that the promoters' figures were wrong.

Mr. Hammond said that in making his estimate of what would be the future demand for electricity, he had taken the number of kilowatts that had been put in by the various authorised distributors to meet a future demand. As an instance, the Charing Cross Co. had made provision for 20,400 KW., and he had reckoned the future demand as 20,000 KW.

Lord Sanderson: You take the basis of what the companies themselves have made provision for?—Yes, in almost every case. He thought that the provision made for the plant had reference to the future growth. He admitted that it would be an advantage to the existing companies if they could supply consumers at the same rate as was proposed by the promoters. It certainly would be a benefit to have two or four stations if they could be worked as cheaply as the one station proposed under the scheme. Witness did not think it was possible that the existing companies could be supplying 46 per cent. of the total horse-power in the London area.

In reply to a member of the Committee, Mr. Cripps said that they had canvassed the whole of the London area to find out how much horse-power would be required. They found that in the area proposed to be supplied by the promoters there was a demand for 208,000 H.P., and that roughly in London there was 100,000 H.P. The existing companies supplied consumers equivalent to 47,299 H.P.—roughly 46 per cent.

Mr. Pollock, K.C., for the Middlesex County Council, cross-examined witness, and pointed out that the Council's objection was that they did not want to be included in the area.

Questioned as to whether the effect of the introduction of the metallic filament lamp would mean that there would be a reduction in the amount of electrical energy used, Witness said he thought the use of these lamps would show the public how much cheaper electricity was as compared with gas, and that there would be an increase in the number of consumers. He knew that there was nothing in the Bill which made it obligatory upon the promoters to supply a person, although existing companies were compelled to supply anyone who asked for a supply within their area. The witness thought that under the Bill an authorised distributor had the first chance of supplying a customer, but the promoters could give a supply if the distributor refused to supply. Speaking for himself personally, he did not think the promoters could object to inserting a clause making it obligatory upon them to supply small consumers when the authorised distributors refused. If it was true that the existing companies could supply the public under as favourable circumstances as the promoters, obviously there would be no need for his company's Bill.

Replying to Lord Lytton, Mr. Pollock said it would not affect his Council if the promoters supplied the existing authorised distributor in Middlesex. Their point was that they did not want two bulk companies competing with one another in the county. Counsel said that even if the promoters did get powers to

supply Middlesex, they would not be able to supply the whole of the trams, as they joined the Hertfordshire County Council trams, and under that Council's order the promoters could not come in.

Mr. Wedderburn, K.C., representing Croydon Corporation, questioned Mr. Hammond as to the need of a supply in Croydon. Witness admitted that there were many large factories in that place. He would not agree to inserting a clause giving the local authority the discretion as to whether the company should come in.

The Committee adjourned.

On Tuesday Mr. Hammond was still in the witness-box.

(*To be continued.*)

London United Tramways Bill.

On Tuesday, May 12th, the Court of Referees, presided over by Mr. Caudwell, considered the objection raised by the London United Tramways Co. against the promoters of the West London, Barnes and Richmond Tramways scheme being allowed a *locus*.

Mr. Szlumper, on behalf of the West London Co., said the proposals of the London United Tramways Co. included the laying of tramways along Kew Road and over Kew Bridge. In 1906 the London United Tramways Co. purchased a horse tramway along Kew Road, and agreed with the Richmond Corporation to electrify the line, but this they had not done. The proposal of the West London Co. was to construct tramways from the centre of Richmond, through Mortlake and Barnes, across Hammersmith Bridge, and to join the London County Council Tramways. If the London United Tramways Co. came across Kew Bridge they must enter into serious competition with his company.

A Member of the Court: Competition could only come about when your line is constructed?

Mr. Szlumper said competition would not come about until both lines were constructed. The London United Co. were in a position of being a horse tramway on the south side of the river and an electric tramway on the north side. Their contention was that it was not a through line.

The Court asked what the contention of the West London Co. was.

Counsel said all they asked for was to be in a position to lay before the Select Committee, which considered the Bill, that their scheme was the best one for serving the district.

Mr. Balfour Browne, K.C., on behalf of the London United Tramway Co., argued that his clients were already in possession of the route, and therefore the petitioners could have no *locus* on the ground of competition.

The Court granted a *locus* on the matter of competition.

On Tuesday, May 19th, a Select Committee of the House of Commons commenced to consider the L.U.T. Bill.

Tramway Employés and Municipal Elections.—In the Parliamentary Papers Mr. Delvin asks the Chief Secretary to the Lord-Lieutenant of Ireland whether his attention has been called to the regulations for motor-men and conductors recently issued by the Belfast Corporation, and in particular to a rule prohibiting such persons from taking any active part in any municipal or general election, whether on or off duty, under penalty of dismissal; and whether, in view of the interference of this rule with the men's rights as citizens, and of the fact that it is not in existence even in the Government departments, the Local Government Board will refuse their sanction to its being enforced.—Mr. Birrell, in reply, states that he was informed that the regulations in question were issued by the general manager of the Belfast Corporation tramways for the purpose of maintaining discipline among the employés. He had been referred to a copy of the particular rule alluded to in the question, which states that motor-men and conductors are expected to refrain from taking active part in any municipal or general election whether on or off duty, but the penalty of dismissal applies only to a breach of the rule committed while on duty. The right of voting is not interfered with. The necessity for the rule is alleged to have been demonstrated by a recent instance in which a conductor canvassed the passengers in his car. The Local Government Board have no powers in respect of these regulations, which are not subject to their confirmation.

Electric Lighting Provisional Order (No. 3) Bill.—On Monday the Examiners found that Standing Orders had been complied with in the case of the above Bill, which confirms Orders in regard to the following districts:—To the U.D.C. of Bridgend in respect of an extension of their area to adjoining parishes in the County of Glamorgan; to Crompton & Co., Ltd., amending the Hendon Electric Lighting Orders, 1899 and 1903, and authorising the transfer of the undertaking to the Hendon Electric Supply Companies, whose offices are at Salisbury House, E.C.; to the Rural District Council of Llandaff and Dinas Powis for amending the Order of 1901, and authorising the transfer of the powers in relation to the parish of Radyr to the Radyr Electric Co., Ltd.; to the Rural District Council of Swansea in respect of the parish of Llansamlet; to the U.D.C. of Oulton Broad, in the County of Suffolk; to the U.D.C. of Sowerby Bridge amending their Order of 1900, and empowering the transfer of the undertaking to the Electrical Distribution of Yorkshire, Ltd.; to the Corporation of Tewkesbury, amending the Order of 1905, and providing for power of transfer to the Tewkesbury Electric Light Co., Ltd.

Contractors and Rates of Pay.—Mr. Tyson Wilson, in the Parliamentary papers, asks the First Lord of the Admiralty whether he is aware that the firms of W. T. Henley's Co., the Western Electric Co., the India-Rubber and Telegraph Co., and Johnson & Phillips, who contract for and supply goods to the Admiralty, pay from 2s. to 8s. per week less than the standard rate of wage to many of the workmen in their employ; and whether, seeing that this is unfair both to the workmen and to firms that compete with them who do pay the standard rate of wage, he will take steps to induce those firms to pay the standard rate, or otherwise strike them off the list of firms that are allowed to contract for Admiralty work. Mr. M'Kenna replies that the Admiralty is not aware that the firms in question are paying wages below the current rate of the district. All contracts with those firms contain the usual clause as to the payment of the current rate, and no complaint of any breach of that clause has reached the Admiralty. If specific details of any cases of underpayment are furnished in respect of Admiralty contracts full inquiry into the matter shall be made and suitable action taken according to the result of any such inquiry.

Tramways Orders Confirmation (No. 2) Bill.—On May 12th the Examiners found that Standing Orders were complied with in the case of the above Bill which confirms the following orders:—Liverpool Corporation, several small junction lines; Potteries and North Staffordshire (Amendment) Order, authorising the Potteries Electric Traction Co., Ltd., and the North Staffordshire Electric Tramways, Ltd., to double existing tramways in Burslem, Hanley, Longton, Newcastle-under-Lyne, Stoke-on-Trent, Tunstall, Cheadle and Stone.

Great Northern, Piccadilly and Brompton Railway.—All opposition has been withdrawn to this Bill which authorises the company to raise further capital, and provides for the rearrangement of the existing capital.

Metropolitan Railway Bill.—This Bill was down for hearing before a Select Committee of the House of Lords on Thursday, May 14th, but as no parties appeared the measure was referred to the Unopposed Bill Committee.

Bristol Tramways Bill.—This Bill should have come before a Select Committee of the House of Lords on May 12th, but there being no opposition, it was removed from the list. The Bill authorises the extension of time for the completion of tramways authorised in 1904.

North-East London Railway Bill.—Mr. Emmott's Committee on Unopposed Bills have passed the preamble of the North-East London Railway Bill, which extends the time for the raising of capital for the construction of a tube railway from the City to Waltham Abbey.

Blackburn Corporation Bill.—The Police and Sanitary Committee have fixed 20 years as the period for the repayment of the loan of £9,200 for the construction of tramways required by the Blackburn Corporation.

ELECTRICITY APPLIED TO FARMING.

The previous history of electrical engineering has been principally confined to use in towns of larger or smaller dimensions; for a variety of reasons it does not seem to have penetrated to any great extent to the country. It should not be forgotten, however, that in agricultural work there is a considerable field for the application of motive power which has not at present been tapped in this country.

Two causes tend to make the prospects of opening up this field more favourable than they have been for many years past; one is the introduction of isolated plants working by a suction gas or oil engine; and the other, and perhaps more important, is the extension of electrical systems into rural districts. Owing to the operations of electric power supply companies over large areas, the gradually increasing public opinion in favour of overhead pole line distributions, coupled with the undoubted economy in first cost of such transmissions, lead to the hope that before very long we shall see electricity supply available to large farmsteads.

That such locations are worthy of development may be shown, firstly, by the example of our American cousins, who exploit this class of load to an extent which may be considered more than experimental, and also by consideration of the types of load that are available on a farm. Taking the latter point first, there are such applications as the operation of dairy plant. In agricultural districts, particularly in grazing counties, it is a common practice to convert the cream obtained on the farm into butter at the dairy and transmit it to the markets in its finished condition, and this source of load is one by no means to be despised.

We illustrate (by the kindness of Messrs. Crompton) the application of motor drive to a cream separator, which is the initial stage in butter making.

Passing on to the internal operations of the farm, motive power is required in and about the farm buildings for such purposes as breaking up oil-cake, cleaning and cutting roots for feeding the cattle, while in harvest time such machines as chaff-cutters and grain mills necessarily require a considerable amount of power. The average brake-horse-power to drive these various machines ranges from ¼ to 2 B.H.P.

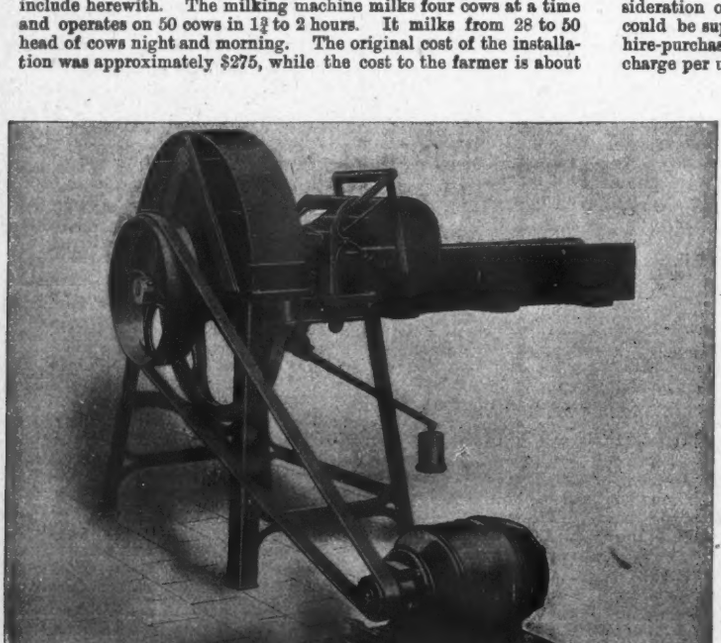
Moreover, on the farm it is frequently difficult to secure an adequate supply of water and the provision of a motor-driven pump either of the three-throw ram type for forcing water from an adjacent stream up to the house tanks or of the suction type for drawing from a well, would be considered attentively by a farmer who has experienced these difficulties. The horse-power of the motors depends on the quantity of water lifted, and the height through which it is raised, taking into account the virtual head due to friction.

Speaking generally, it may be taken that a small pump, electrically operated, will give an efficiency of about 50 per cent., excluding pipe friction on the weight of water, multiplied by the height through which it is lifted.

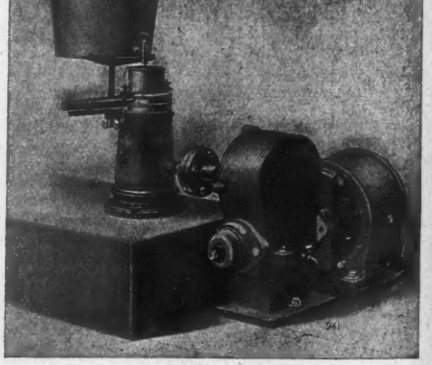
Some time ago we drew attention to an article by Mr. Frank H. Plaice, in the *Western Electrician*, dealing with an experiment made by an electricity company at Bremen to obtain farm service. As a result, they had six miles of such service lines in operation supplying 24-hours' service; 15 motors aggregating 50 H.P., and about 150 lamps were put on to the mains in this way, and one of the most interesting items was the operation of a milking outfit by means of electricity. By the courtesy of Mr. Plaice, we have been enabled to obtain a photograph of this apparatus in operation, which we include herewith. The milking machine milks four cows at a time and operates on 50 cows in 1¾ to 2 hours. It milks from 28 to 50 head of cows night and morning. The original cost of the installation was approximately $275, while the cost to the farmer is about $6 a month for energy. The plant takes the place of three men during milking hours and the milking is much better done than by hand, and to all appearance to the much greater satisfaction of the cows.

The way in which this company arranged for connections for farm work was to supply a motor mounted on a portable truck for service farm work, and this was kept available for connecting by the outside operator, whenever any service was required. The only trouble experienced by the supply company with regard to consumers was that sometimes one of the big motors on the farm would be started away suddenly on light load, causing a temporary falling of the supply pressure. It would seem that this mode of extending power business, for central stations situated in rural districts, would lend itself very admirably to consideration. At present the work is in the hands of isolated plant manufacturers, and the initial cost of the generating plant, even if the current can be supplied at a cost of a penny per unit, places it rather outside the consideration of many farmers who would adopt such a system if it could be supplied to them by means of electric service on a hire or hire-purchase system, the cost being carried by a slightly higher charge per unit. It would appeal to them, inasmuch as at present in order to carry out these operations, they have either to buy o hire portable steam plant t o drive their machinery during times of stress, inasmuch as hand labour is ruinous for such a purpose on any considerable scale.

Electricity Applied to Farming: An Electrical Milking Outfit.



An Electrically-driven Chaff Cutter.



Cream Separator with Motor Drive.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"(*a*) Would you please give particulars of an Urban District Council supplying water to houses outside the urban area. Viewed in the light, they are no worse offenders in this respect than an electric light company supplying consumers outside area prescribed by Provisional Order.

"(*b*) 1s. per quarter meter-rent is charged by an electric light company. What is the minimum the company can legally demand from consumers for current—consumed or not?

"(*c*) Does not the introduction of the high-efficiency lamp render the law on this point important?"

*** As to (*a*), we are not aware of any water company supplying water outside its authorised area of supply. What a water company may or may not do does not appear to affect the law, which clearly provides that an authorised electric supply company cannot supply electricity except within the prescribed limits.

As to (*b*), it is impossible to state in general terms what is the minimum which a company may charge. It depends in every case upon the terms of the Provisional Order.

REVIEWS.

Electric Arc Lamps. By J. Zeidler and J. Lustgarten, M.Sc. London: Harper & Bros. Price 5s.

This book should form a handy work of reference for all who are engaged either in the manufacture or the use of the arc lamp for illuminating purposes. The original work was written by a practical engineer connected with the A.E.G. Co., Berlin, and the present British edition has been revised and brought up to date by a lecturer of the Manchester School of Technology. Lamps of German manufacture have not undue prominence; each lamp mentioned has its mechanism fully described and a diagram showing the electrical connections. The authors have managed to keep clear of that objectionable form of padding found in so many books, dealing with ancient history and describing the earlier forms of apparatus long since defunct. The most recent investigations by Mrs. Ayrton, Leonard Andrews, and others on the electric arc have been consulted, and several of the latest types of flame lamps are fully described. Formulæ are cut down to the minimum, and while the work will prove of great value to students, it will be most appreciated by the practical engineer who is responsible for the choice of a suitable type of lamp, and for the overcoming of the practical difficulties met with in the working of the same.

Turning our attention to the details of the book, we find that the authors first of all deal with the carbons and the peculiarities of the arc. The special shapes attained by the positive and negative carbons under varying conditions are described and illustrated by means of photographs. The objectionable hissing sometimes met with is shown to occur when the crater of the positive carbon extends and becomes too large to occupy the tip of the carbon. Enclosed and alternating arcs are next described, and the effects obtained by the use of cored or uncored carbons explained. In the case of the alternating arc, its effect on the wave form and power factor of the circuit is fully gone into, with the necessary steps to be taken to ensure the stability of the arc. The first commercial flame lamp came from Germany, and the reason of the success of this type of lamp is shown to be the large amount of light emitted by the flame between the two carbons compared with the light given out by the positive crater, which is the principal source of light in the ordinary arc. A fuller description of the developments of the "magnetite" lamp in use in the States would have been acceptable. At the foot of page 13 the sentence should read as follows:—'The total P.D. required for the carbon flame arc is about 45 volts, of which a P.D. of 17 volts is the drop from the positive carbon to the arc, a P.D. of 18 volts *across the flame, and a P.D. of 10 volts from the flame to the negative carbon.*" (See L. Andrews's paper before the Institution on "Long Flame Arc Lamps," page 15.) In Chapter II the various devices adopted by different makers for striking and feeding both the focusing and the non-focusing types of lamps are clearly shown by diagrams. In discussing the working of lamps in series on page 22 the authors make a statement which is not correct: "Only by means of auxiliary apparatus operated by the D.P. across the arc, which inserts a resistance in parallel with the solenoid, and thereby influences the ampere-turns of the latter, can the series type lamp be worked in series, in practice." There is a very successful series type lamp manufactured by an English firm which does not depend on the above-mentioned arrangement for the successful working of the lamps in series. The device is the invention of Mr. F. Lewis, and consists of an auxiliary series coil which sucks up an armature connected with the rocking gear immediately the lamps are switched on. This solenoid, while allowing the carbons to feed together, prevents them from actually touching, and when the arc finally fails, the armature drops and the lamps all strike up anew.

The first part of the next chapter is devoted to details and drawings of various parts of the lamp mechanism. The necessity for using a reflector immediately above the arc of an alternating lamp is shown to be due to the fact that as much light is thrown upwards by the bottom carbon as the upper carbon sends downwards. In the descriptions which follow of several direct-current lamps of German manufacture, it appears that special devices are adopted for ensuring perfect electrical working which British manufacturers seem to ignore. In this they are probably quite right, as the modern arc lamp, especially of the flame variety, is already such a complicated piece of mechanism that the introduction of any other contrivances must tend to unreliability in working. For instance, a resistance is put in circuit with the shunt coil to correct for temperature error as the lamp heats up. This resistance is also partially short-circuited at times to counterbalance the influence of the hysteresis of the magnet and friction. Special temperature compensators are employed by the firm of Messrs. Körting and Mathiessen. From the number of shunt lamps described, it would appear that they are extensively used on the Continent, although in Britain they are rarely met with.

There is a mistake on pages 63 and 65 which is rather confusing. The diagrams are wrongly placed; fig. 56 should be on page 65 and fig. 58 on page 63. The tables given throughout the book, giving the sizes of upper and lower carbons for lamps taking different currents and voltages A.C. and D.C., should prove very useful.

Flame arc lamps are what illuminating engineers are most anxious to know about, and those of the A.E.G., Union Co., Westinghouse, and Oliver Co. are fully described. Some very good photographs are shown of both alternating and direct-current flame arcs, illustrating the effects obtained by inclining the carbons at different angles. On page 86 the authors state that in the interests of a steady light, the carbons used in this type of lamp must be comparatively thinner, and therefore must be much longer than those used in the ordinary type of lamp to burn the same number of hours. Owing to their length the ohmic resistance is high and special clutch contacts (illustrated) must be introduced near the carbon points to avoid a variation in the pressure across the arc as the carbons burn away. These clutches must surely interfere with the satisfactory feeding downwards of the carbons, introducing frictional errors, and in the event of a slight irregularity in the diameter of a carbon or a roughness of the surface preventing the feeding altogether. Most makers use a metal-cored carbon to effect the same result.

There is apparently an illustration missed on page 87, as the fig. 81 referred to is not shown. In referring to the construction of the Westinghouse flame lamp on page 91, it is stated that a cast-iron economiser is fixed just above the arc. One would imagine that two carbons of opposite polarity projecting through a slot in a metallic conductor would offer possibilities of shorts, and also cause the flame to arc on to the sides of the economiser. The "Oriflamme" arc lamp, which is very fully described, has a most elaborate and ingenious mechanism, but seems to work well in practice. It is certainly economical with the carbons.

On page 97 a table is given of sizes of carbons, current taken, and lamp pressures. The results obtained in practice

with the "Excello" flame arc are much superior to the figures given. For example, a 10-ampere lamp with carbons 25½ in. long only burns for 16 hours, according to the table, while a 10-ampere "Excello" lamp with carbons only 33½ in. long burns from 17 to 18 hours easily without the use of the inner globe.

A description of a number of enclosed arc lamps brings this chapter to a conclusion, and the next one deals with the distribution of light and the proper arranging of arc lighting both for outside and inside illumination. The curves shown in fig. 122 show very plainly the great superiority of the direct-current lamp over the alternating-current type. What do the authors mean by stating that the curve No. 2 is for a "three-wire arc lamp"?

Again, they state at the bottom of page 124 that "the efficiency of arc lamps is diminished somewhat when worked in series on account of the extra power spent in the steadying resistance." The opposite is surely the case; in fact, the authors on page 24 state, whilst speaking of a single arc lamp, that the P.D. across the external resistance must be 30 per cent. of the arc P.D. Taking a P.D. across the arc of 40 volts, 12 volts must, therefore, be dropped in the resistance, thus causing 120 watts to be lost in a 10-ampere lamp. On page 55 it is stated that five lamps of the same type will burn in series across 220-volt mains, which only allows 20 volts drop in the resistance. Assuming 10-ampere lamps again, the watts lost in the resistance will only be 200, or 40 watts per lamp. Six "Oriflamme" lamps can be operated successfully in series across 250 volts, which must surely be acknowledged as most efficient working.

The alternating-current flame lamp with inclined carbons is shown to be a most efficient type of lamp, second only to the direct-current flame arc. This will enable alternating-current stations to do away with rectifiers and still obtain efficient and economical lighting.

The authors conclude with a chaper on arc lamp accessories.

The Engineers' Year-Book, 1908. By H. R. KEMPE, M.Inst. C.E. London: Crosby Lockwood & Co. 1908. Price 8s.

The fifteenth annual appearance of this useful volume comes with over one thousand numbered pages of matter and a copious index, and in spite of this it is much thinner than the edition of three years ago, yet the paper is fully as opaque and better in colour. It would be strange in a book so full of information as this if no errors or ambiguities crept in. Two such may be noted.

At page 767 Hawksley's rule for water-pipe diameters is apparently insufficiently stated, the quantity q being gallons per hour, whereas a non-expert might take it as per four hours. So also on page 733 the matter dealing with air-lift pumps should be somewhat altered, for in its present form mistakes may be made in regard to the amount of submergence.

Of new material, the more important of the reports of the British Standards Committee have been abstracted, notably of the large sizes of electricity supply mains, and the standard sizes of angles, tees, bulbs and other rolled sections of steel, also railway rails, and fish-plates.

A useful table for a future edition would be one of $\frac{3}{2}$th powers, or $\sqrt[3]{N^3}$ of numbers for hydraulic calculations, or one simply of fifth powers and roots.

Of new methods lately come into particular prominence, reinforced concrete construction is, perhaps, one of the most prominent, and over ten pages are given to this subject, which will serve to give useful information and confidence in its use to those who have not yet had much experience in the use of the new material. Reinforced concrete is by no means new, but it has only been brought into serious commercial use during the last few years; but it is many years since an early enthusiast on concrete rowed about on the Thames in a boat of concrete.

Reinforced concrete poles for electrical transmission lines are used to a considerable extent in Canada with great success, though when they were proposed in this country nothing was too bad to say of the proposers. A reinforced concrete pole was to be seen at the Liverpool exhibition over twenty years ago, and slow as men are in this country, this material is certain to find extended application as its merits become known, if contractors will take care not to use inferior Belgian cements and dirty aggregates.

No engineer should be without this book. It has been said that pocket books contain everything but just the one item one is wanting. This fault is less likely to be found with Kempe than with most of the general information books of this order, for it is a veritable encyclopædia.

BUSINESS NOTES.

Consular Notes.—COREA.—In a recent report on the trade of Corea, the German Consul at Seoul states that the American Corean Electric Co., which some years ago established electric tramway and lighting plant in that town; showed in 1906 receipts 179,895 yen, and expenditure 132,823 yen. In 1905 the receipts were 174,444 yen, and the expenditure 140,292 yen. The length of line is 18 miles, with 37 passenger carriages and 18 goods wagons. In 1905 the company issued a 6 per cent. loan of $300,000, to be used for the erection of a second power plant and for improvements and acquisition of new rolling-stock. The Chemulpo Electric Co., which opened its plant (of German origin) on April 1st, 1906, was supplying to 3,500 lamps at the beginning of 1907. The plant is to be extended to cope with the demand.

TURKEY.—The German Consul at Beirut, in a recent report, states that the electric lighting and tramway plant of Damascus belongs to a Belgian company. The works were completed in February, 1907. The concession is for 99 years, and was granted to an influential Turkish official, who sold it to the Société Imperiale Ottomane des Tramways et d'Eclairage Electrique, of Damascus (capital 6,000,000 francs), for a sum of 800,000 francs; the company referred to was formed by the Société Nationale des Chemins de Fer Vicinaux, of Brussels. Damascus is the first town in Turkey to possess an electric system, and this is due to the fact that there exists cheap water-power in the neighbourhood. The contract for a great part of the plant was given to a Berlin firm. The tramway connects the northern and southern districts of the town. The system is 4,500 metres long, and the rolling-stock comprises 19 motor-wagons and 16 tenders, which were purchased in Belgium. The tramway has had very good business. The street lighting is not yet in full working order, but electric light has already been installed in a few hotels and in various shops in the street bazaars; the Omagaden mosque is also lighted by electricity. The municipality has agreed to pay to the company 3,000 Turkish pounds per annum for 1,000 8-C.P. lamps and eight arc lamps of 500 C.P. In Beirut also an electric tramway is being constructed. In May, 1906, a 99-year concession for tramways and lighting in the town was obtained by a Turkish subject and was sold to a Belgian company for 700,000 francs. This company, the Société Ottomane des Tramways et de l'Electricité de Beyrouth, with a capital of 3,600,000 francs, has its head offices in Constantinople, and is not identical with the Damascus company referred to above. It was formed by the Trust Franco-elfe de Tramways et de l'Electricité of Brussels. The works were begun in the summer of 1907. Electrical power is to be produced by steam-driven plant. The length of tramway line which the company is pledged to construct is 12 kilometres, and the municipality has agreed, for a round sum to be paid by the company, to widen certain streets through which the tramway will run.

In this connection it may be noted that in a recent report, H.M. Consul at Jerusalem stated that British manufacturers might well pay more attention to Palestine. The increase of population has naturally brought about a considerable augmentation of the imports, the volume of which has nearly doubled in five years. The tendency is likely to continue, especially when the completion of the Hedjaz Railway leads to the opening up of districts hitherto devoid of all means of communication; other railway projects are under consideration, and everything points towards the general development of the country, and the increase of its requirements in the near future.

INDIA.—In a recent report on the trade of Madras, the Austro-Hungarian Consul at that town states that the electro-technical industry has made and continues to make tremendous strides in Madras, as well as in the whole of India, and will prove to be of great importance to the country. Every available water power will be utilised, and where such do not exist, steam and other engines will be installed. Madras itself will soon be in possession of a general electric street lighting plant, while in the smaller towns electrical plants are proposed and a new important trade is being opened up for European industry. In addition to some British firms, German makers have also appeared on the market, and a well-known German firm has already taken large contracts.

FRANCE.—The British Consul at St. Nazaire, in a recent report, states that the facilities of the port are to be increased by the construction, on the quay of the Penhouet dock, of an electric crane with a lifting power of 180 tons. This crane will be able to lift 180 tons to a height of 145 ft. above the quay level, and take it to a distance of 34 yards outside the quay. The arm of the crane will be fitted with another travelling crane of 15 tons lifting power.

BRAZIL.—In a recent report on the mining industry of Minas Geraes, Brazil, the British Vice-Consul at Rio de Janeiro states that one industry which is still undeveloped is that of smelting. The whole of the elevated region constituting the centre of Minas Geraes is notably rich in iron ores whose purity is remarkable, but the difficulty remains that the iron cannot be converted on the spot into commercial products until some economical method of smelting is discovered. It is said that electricity would be too expensive, but with the existing water power it seems that this would be the best possible solution, unless the price of coke is considerably reduced. The school of mines at Ouro Preto is shortly going to make some experiments in smelting. A firm of electricians might be able to obtain some small orders, and could use this opportunity to study the country and the abundant water supply with a view to eventually installing a plant for smelting purposes.

AZORES.—The British Consul in the Azores, in a recent report, states that in machinery the United Kingdom obtained a good share of the import trade in 1907, as shown in the following statement:—

Machinery for Industrial Purposes.		*Engines of 30 H.P.*	
From United Kingdom ..	£2,542	From United Kingdom ..	£2,405
„ Austria and Hungary ..	679	„ Germany	513
„ Switzerland	434		
„ Germany	288		
„ France	100		
„ United States	43		
Total ..	£3,986	Total ..	£2,918

The value of machinery imported in 1907 was therefore £6,934, of which amount the United Kingdom's share was £4,947, a great advance over the amount in 1906, the value in that year being only £978.

CHILE.—The British Consul at Valparaiso, in a recent report on the trade of Chile in 1907, states that machinery for the new nitrate works was imported mainly from the United Kingdom and Germany, the United Kingdom securing the larger share of these orders, the chief portion of which are for boilers, tanks and piping. British work in this department is well-known and gives satisfaction. In the case of electrical goods, however, America and Germany appear to be ahead of the United Kingdom, and, as there is a growing tendency towards an extension of the use of electricity, it is to be regretted that British makers are not competing more successfully. In both stationary and portable engines the United Kingdom holds her own, and strength, finish and simplicity (a very important feature in machinery for this market) leave nothing to be desired. One growing impediment to business is the defective handling of merchandise by the railways. The great delays increase the cost of the goods to the buyer very materially, and unless some remedy is soon found a falling off in business is likely to take place. Another factor which plays a most important part in business in Chile is exchange. During the last four years the value of the paper dollar has depreciated, chiefly on account of repeated issues of notes, nominally payable in gold, but in reality at present unconvertible. Catalogues printed in Spanish are most necessary; it is practically impossible to introduce or get orders for machinery unless descriptions are given in the language of the country. Furthermore, no commercial traveller can hope to meet with any success unless he knows Spanish well. The home dealer should select a few of the better class houses in each town in the particular district which he is anxious to open up, and submit samples and prices to them from time to time, and not forward them indiscriminately to each and every house dealing in the particular class of goods as enumerated in a directory. Often in the case of a new article being produced it is offered and sold to all dealers, who, in turn, find themselves in fierce competition with each other over it, with the result that not only are the prices lowered, but the sale of the article is frequently killed altogether. Given an agent of their own nationality, our merchants at home could get to know their customers, their standing and reputation for commercial character and morality. Already we have a few excellent travellers, but could do with many more. A regular traveller with tact and a good supply of samples will always do well. He should be a responsible man. It is often worth while to send a junior member of the interested firm—as do foreign houses—a man capable of judging whether it would be worth while for his firm to open a branch establishment or to appoint a suitable local agent. Attempts to introduce goods into this Republic without a certain outlay will be found quite useless. In fact, a small visible stock at hand will be found the best mode of introducing goods. Liberal advertising is invaluable for the improvement of trade and commerce, the people being easily led to purchase in this manner. The Consul will gladly supply a list of likely periodicals on application. There are, in spite of obstacles, a few home trade journals which manage to circulate and do much good. Our packing is better than that of any other country. It must not be forgotten, however, that weight, even in the cases and coverings, adds to the duty levied, for all duties are collected on the gross weight. At the same time, goods should be well packed in view of the rough handling which they undergo on the railways. It is well, when the customer is known, to grant credits of from two to six months, and buyers have grown accustomed to even longer terms. It is almost impossible to collect a debt, so great care should be exercised. For machinery and rolling-stock, an agent with authority and technical knowledge and acquainted with the country is necessary. Orders for Chile should be rushed, in order to counteract as far as possible the great time taken in transit. It is necessary that our manufacturers and merchants, when quoting, should include all charges inclusive to destination, or at least to the port of embarkation, f.o.b. It is a mistake, when supplying catalogues, not to quote all discounts allowed. In machinery, standardisation is desirable wherever possible. The facilities for effecting repairs thus brought about induce people to purchase American-built engines and machinery when they would otherwise purchase British.

Trade with Egypt.—The report by Sir Eldon Gorst on the finances, administration and condition of Egypt in 1907 incorporates a statement on British trade with that country. It appears that the value of the imports from the United Kingdom amounted to 32·5 per cent. of the aggregate imports into Egypt, as compared with 32·7 per cent. in 1906; whilst the exports to the United Kingdom formed 54·3 per cent. of the aggregate value of the exports in 1907, as contrasted with 53·9 per cent. in the preceding year. The figures given for the imports of machinery and "iron instruments" in the past two years are as follows:—

	Total imports.	Share of the United Kingdom
Machinery in 1907	£E1,069,537 ...	£E567,193
„ „ 1906	1,205,301 ...	641,790
Iron instruments in 1907 ...	90,646 ...	36,876
„ „ 1906 ...	71,141 ...	31,594

It is stated that the number of agricultural and electrical machines imported has increased, and that iron instruments, while exhibiting an increase in the case of Great Britain, have to fear competition from Germany. In instruments of precision the imports from the United Kingdom advanced from £25,000 in 1906 to £27,000 in 1907; and those from Germany have also progressed, but France and Italy have experienced a decline in this respect. In a second report, dealing with the affairs of the Soudan, Sir Eldon Gorst mentions that telegraphic communication was established during the year between Khartoum and Gondokoro, Uganda, and that the estimates for 1908 include a provision of £13,100 for extension of the electric lighting installation, and £9,800 for telegraph extensions.

B.T.-H. Power Installation Contracts.—The following is a list of important orders recently secured by the Power and Mining Department of the BRITISH THOMSON-HOUSTON CO., LTD.:—

Sheffield Coal Co., for their Birley Collieries, near Sheffield.—One 250-KW. 375 R.P.M. 3,000-volt 50-cycle three-phase B.T.-H.-Belliss generating set; three-panel main switchboard; five sets of main and tail haulages (two of 30 and three 50-H.P.); two motor-driven pumps (30 and 80 H.P.); one 100-KW. and two 70-KW. transformers, and high-tension and low-tension panels.

Pease & Partners, Darlington, for plant to be installed at Bowden Close Colliery.—One 120-H.P. 480 R.P.M. 440-volt 40 cycles three-phase slip-ring protected type haulage motor, with tramway type reversing controller and panel; one 25-H.P. 770 R.P.M. fan motor; and one 130-KW. three-phase 2,750/440-volt oil cooled transformer, with the necessary switchgear.

Morris & Shaw, Ltd., Birch Coppice Colliery, Polesworth, near Tamworth.—A main switchboard, pit bottom and feeder panels; one 75-H.P. three-phase motor for driving endless haulage gear, and the requisite feeder cable.

Gwynnes, Ltd., Hammersmith.—Testing plant, consisting of a 120-KW. motor-generator set, made up of two 60-KW. D.C. generators tandem coupled to one induction motor; one 110-K.V.A. three-phase motor-generator, and a motor exciter of 10 KW.

D. Selby Bigge & Co., for Earl Fitzwilliam's Colliery, Elsecar, near Sheffield.—One 350-KW. exhaust steam turbo-alternator, with heat accumulator, condenser, and the requisite switchgear.

Vickers, Sons & Maxim, Ltd, Barrow-in-Furness, on behalf of the Admiralty.—Twenty-one motor-generator sets, each giving 120 amperes at 55 volts (6·6 KW.) and 1,600 R.P.M., with the necessary control panels. These are to operate searchlights on board H.M.S. *Vanguard*, a battleship of the *St. Vincent* class, which Vickers, Sons and Maxim are building.

Glenboig Union Fireclay Co., Glenboig, Scotland.—Two 45-H.P., one 25-H.P., and one 15-H.P., three-phase motors and panels, and two transformers, for driving pumps at their works.

Finlayson, Bousfield & Co.'s linen-thread mills, Johnstone, Scotland.—One 200-KW. 425 R.P.M. 300-550-volt 60-cycle three-phase alternator, with rope pulley, base plate, and direct-coupled exciter, together with the necessary switchgear.

Joshua Whiteley & Co., Ltd, Huddersfield, for their "Albert" textile mill.—Complete installation, consisting of 23 three-phase induction-motors totalling upwards of 500 H.P., with the necessary steel work for mounting the ceiling motors, and controlling gear and cables. This is the first textile mill to be electrically driven from the Corporation three-phase mains in the Huddersfield district.

D. Selby, Bigge & Co., Newcastle-on-Tyne, for the Cannop Collieries, near Lydney, Glos.—Two 300-KW. 375 R.P.M. 2,750-3,000 volts 30-cycles three-phase alternators, complete with exciters and rheostats, for direct coupling to high-speed engines.

Steel, Peach & Tozer, Ltd., Sheffield.—One 750-KW. 285 R.P.M. "N. P." type continuous-current generator for direct coupling to Belliss engine.

J. Booth & Bros., Rodley, near Leeds.—Equipments for four cranes.—Two 24, two 15, one 10, one 8, four 7½, one 5 and two 3-H.P. three-phase 400-volt induction motors, 710 R.P.M., in all 13 machines, complete with tramway type controllers and brake magnets.

Admiralty.—Nine motor-generators (eight 120 amperes and one 8 amperes) for operating searchlights on H.M.S. *Defence*.

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Robt. Addie & Sons Collieries, Ltd., for their Roashal Colliery (No. 7 Pit), Coatbridge.—One 250-KW. (310 K.V.A.) three-phase generator, 350 volts 50 cycles, coupled direct to Belliss engine.

Messrs. Stevenson, McGuffie & Milne, of Glasgow, for Binley Colliery, belonging to Messrs. Merry & Cunningham, Glasgow.—Two 62½ KW. D.C. generators, coupled on combined base to one Howden engine, also a four-panel switchboard.

The Ansley Hall Coal and Iron Co., Atherstone, Warwickshire.—One 500-KW. 340-R.P.M. 500-volt compound-wound open type D.C. generator, to be driven by ropes by a pair of Robey engines running at 85 R.P.M., also two switch panels for same.

The Dean and Chapter Coke Oven Plant of Messrs. Bolckow, Vaughan & Co.—Eight 16-H.P., two 10-H.P., and four 3½-H.P. three-phase motors, complete with controllers and switches.

Book Notices.—*Motoring Annual and Motorists' Year-Book*, 1908. London: *Motoring* Illustrated. 2s. 6d. net.—To motorists this is a useful volume, and it is also interesting to others who, for reasons many and various, are unable to follow the modern fashion. It claims to be, and is, an encyclopædia of the year's automobilism, including particulars of automobile clubs and lists of their members, world motor records, speed, and other tables.

Praktische Photometrie. By Dr. Emil Liebenthal (of the Reichsanstalt, Charlottenburg). Brunswick: Fried. Vieweg und Sohn. Price M. 19.—This book contains a comprehensive account of the subject of light measurement, and is far more than a mere practical guide to photometry, as its name would seem to indicate. In fact, it is just as a guide in the practical work of photometry that it would fail, because of the somewhat scattered arrangement of the matter. The information, when collected, is, however, satisfactory and up-to-date. Chapter I deals with the nature and sources of light, and Chapter II with the energy considerations connected with light emission. The latter subject is further discussed, with more or less repetition, at intervals throughout the book. Chapter III deals with the physiological action of light on the eye, and the nature of the photometric problem. Chapter IV contains very full descriptions of the various standard lamps. Chapters V and VI deal with photometers for use with sources of the same colour and with sources of different colours respectively. From 30 to 40 different types of photometer are described here, many of which are not in practical use, and the absence of critical comparison is likely to lead to confusion in the mind of the uninitiated reader. Only four pages are given to the important problem of the flicker photometer. In Chapter VII spectral photometry is thoroughly discussed. Chapters VIII and IX discuss the determination of the mean candle-power and the arrangements of photometer rooms. Chapters X and XI deal with the specific consumption of energy by various lamps, and with their light distribution curves, and Chapter XII contains reprints of various official rules for the photometry of gas and electric lamps. The diagrams throughout are clear and numerous, and the book will form an admirable reference work on all photometrical matters.

Die Drahtlose Telegraphie im Internen Recht und Völkerrecht. By Prof. Dr. F. Meili. Zurich: Art. Institut Orell Füssli. Price M. 3.50.—This short treatise on the present state of the laws of all nations with regard to wireless telegraphy appears at a time when there is still considerable uncertainty on the subject, so that the treatment is bound to be more or less tentative. The writer shows that the existing telegraph and telephone laws can be, and in many cases have already been, made to apply to wireless telegraphy, but that certain additions or alterations are called for in connection with such points as private telegraph installations, the secrecy of messages, &c. When the subject of international law is considered, new difficulties are introduced, chiefly because of the absence of definite rights to the atmosphere. Probably something equivalent to the three-mile limit at sea coasts will be adopted, with an additional clause dealing with the height to which the right applies. The same point may have to be faced at any time in connection with airships. The writer next considers the wireless telegraph rights of belligerent and neutral States in time of war, and shows that the subject bristles with difficulties, both legal and technical, which can only be settled by international agreement. The book concludes with a discussion of the various clauses of the 1906 International Convention on Wireless Telegraphy, and the complete text of the Convention is given.

"Proceedings of the American Society of Mechanical Engineers." May, 1908. Vol. XXX, No. 5. New York: The Society. Price $1 per copy.

"American Institute of Architects: Quarterly Bulletin." January, 1908. Vol. VIII, No. 4. Washington, D.C.: The A.I.A. 1908.

"The Technical Index." May. Vol. XII, No. 2. London: Fitz-Patrick. 1908. Price 1s.

Catalogues and Lists.—MESSRS. DONOVAN & CO., 12, Barwick Street, Birmingham.—Circular No. 41, containing full particulars and illustrations of their Barwick motor starter and regulators. The resistance part consists of non-corrodible wire, wound tightly on vitreous china bobbins, which are then mounted in iron frames and fastened to the slate. By undoing the four corner fixing screws holding the slate to the box, the whole of the slate resistance and switch can be taken away for inspection. The slate is enamelled. The starters are made in single and double automatic types, and we understand that a feature is that no sand, enamel or asbestos is used; they consist simply of china, slate and metal. Three types are shown thus:—(A) Showing the open type starter fitted with double automatic release; (C) semi-enclosed; (B) totally enclosed. The firm's motor-starter panels fitted with their switches and fuses are shown, also three-phase starter switches, field regulators, and Barwick punkah fan regulators, of which large numbers have been supplied for use in the East.

THE ELECTRICAL CO., LTD., 121-125, Charing Cross Road, W.C.—Several new leaflets: No. 281, particularising several types of D.C. dynamos and motors; No. 282, giving prices of A.E.G. Economica arc lamps; and No. 283, which is a price circular of the new automatic self-focusing "Projector" lamp. Also a neat 20-p. pamphlet showing designs of a number of pleasing electric light fittings.

UNION ELECTRIC CO., LTD., Park Street, Southwark, S.E.—Booklet containing a large number of views of public thoroughfares in this and other countries, and interiors of buildings of various descriptions in which their different types of arc lamps are employed.

MR. L. HERVE, 90, Clerkenwell Road, London, E.C.—Pocket price list of screws (British Association threads) which are kept in stock.

MR. G. B. BOWELL, Terminus Chambers, Holborn Viaduct, E.C.—Eight-page pamphlet containing illustrated particulars and prices of Bowell's silent electric clock system.

THE ELECTRIC CONSTRUCTION CO., LTD., 9, New Broad Street, London, E.C.—New pamphlet (12 pages) entitled "The Choice of a Lift," in which are described the E.C.C. electric lifts and hoists. Neat half-tone views of the equipments are shown.

MESSRS. CARRICK & RITCHIE, Edinburgh.— 32-page pamphlet giving illustrated descriptions of their Waverley and Girard turbines, Pelton water-wheels, and other water motors.

MESSRS. SPAGNOLETTI, LTD., Goldhawk Works, Goldhawk Road, London, W.—Well-bound catalogue (60 pages) setting out a large number of half-tone and line illustrations of their various switchgear manufactures, also measuring instruments and telegraph and signal apparatus. Prices are very plainly indicated.

MESSRS. PETER M'INTOSH & SONS, 129, Stockwell Street, Glasgow.—Illustrated price list of their Zebra brand laminated leather belting.

THE SUN ELECTRICAL CO., LTD., 118/120, Charing Cross Road, W.C.—New and more complete catalogue (24 pp.) of their "Kalkos" system of conduits and fitttings, of which we gave full particulars some months ago. In addition to illustrations and prices of different parts there are some introductory notes concerning the system, and the advantages which are claimed for it; also some pages devoted to hints on estimating and instructions for erection.

PELAPONE ENGINE CO., LTD., Great Wilson Street, Leeds.—Catalogue containing excellent half-tone prints, and a general description of their Pelapone paraffin engine of from 3 to 20 H.P. for private electric light installations.

EDISON & SWAN UNITED ELECTRIC LIGHT CO., Queen Street, London, E.C.—New electric light fittings catalogue, which, we understand, is far in advance of that issued last season. In addition to the usual brown-covered edition, which is Part 6 of the Standard Catalogue, many additional and beautiful designs are included in a supplementary edition. Both of these are uniform in size with the other catalogues of the firm, and are punched for insertion in the Ediswan binder. The catalogues are profusely illustrated, most of the photo reproductions being one-sixth of the full size. These are not taken from wash drawings, but from photographs of the actual fittings. There is a comprehensive general and numerical index, by means of which any fitting can be turned up either under its catalogue number or under its description. A number of entirely new designs are included, but as fresh patterns are continually being brought out by the firm, it is evident that the most carefully-compiled list can only contain a selection. Indeed, the firm inform us that since the completion of this catalogue for press, no fewer than 10 supplementary leaflets, each illustrating from one to four new designs, have had to be printed. Copies of these, together with the two catalogue sections mentioned, can be obtained from the publishing department of the firm on receipt of trade card.

CREDENDA CONDUITS CO., Scholefield Street, Birmingham.—Catalogue and price list (B) of 24 pages, containing well-arranged particulars of prices of their C.C.C. water-tight electric conduits and fittings, the latter including connection, junction and other boxes, water-tight pendants, switches, plugs, ironclad switch-fuses, dustproof fittings, and so forth. The book is clearly illustrated.

MESSRS. G. M. BODDY & CO., Newington Works, Liverpool.—Leaflets relating to the "Metalik" lamp, which they were the first to introduce last year. This lamp has an efficiency of 1½ watts per candle, and an average life of 1,000 hours; it is supplied for all voltages up to 250 volts, and can be burnt in any position, owing to the special mode of anchoring the filament. Instances are given of 220-volt 50-C.P. lamps, used by a Corporation for street lighting, burning in a sloping position on alternating current for as long as 1,856 hours without blackening or failure.

Tantalum Lamps.—A contract has recently been placed with MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., by the Brighton Corporation for the supply of 15,000 16-C.P. "Tantalum" lamps, which will be used for series burning in the majority of side streets in lieu of the carbon-filament lamps. The company have also recently fitted up two trains on one of the London Underground Electric Railways with "Tantalum" lamps, with highly satisfactory results.

Trade Announcements.—THE BROWNE ENGINEERING CO. have moved from Broad Street Place to Dixon House, Lloyd's Avenue, E.C. Their telephone number is altered to 1306 City.

We learn that MANNHEIM INDIA-RUBBER, GUTTA-PERCHA AND ASBESTOS WORKS CO., LTD., of 93, Leadenhall Street, London, E.C., are making good progress in the production and sale of their ebonite goods and rubber insulating tapes. They are making a special feature of ebonite cells for accumulators, forks, separators, india-rubber corks, &c. Arrangements have been made for a large stock of sheet, rods, and tubes to be kept in London.

We are informed that MESSRS. Max Schorch & Co., Ltd., Rheydt, manufacturers of motors and dynamos for direct single, two and three-phase A.C. motors and generators, have opened a branch which is carried on under the name of the SCHORCH ELECTRICAL CO., at 35, Basinghall Street, London, E.C. Mr. Walter R. Rothenberg has been appointed as general manager for the business in England and Colonies. Among the special features to be introduced are complete electrical outfits for mines and collieries; high efficient A.C. loom motors; high voltage switchboards and oil switches; and general plant for central stations. The Rheydt works were established in 1881, and we understand that during the past few years about 6,000 installations, totalling 250,000 H.P., have been supplied by them. We have received a pamphlet giving a list of some of the works for which these plants have been installed.

THE LONDON ELECTRICAL FITTINGS CO., LTD., have now changed the title of their company to GALSWORTHY, LTD., their reason for doing this being, they say, that there were too many firms with names which conflicted with their own. The address of the showrooms will still be 15 and 16, Newman Street, Oxford Street, W., and their will be no change in the management of the business.

THE SWISS MICA INSULATING WORKS, LTD., have formed a special department to meet demands for their brown amberite plates, which they are making in various widths up to 1,600 mm., and in lengths up to 2,500 mm. These long lengths overcome the expense and time of joining plates together, and meet the requirements for large size sheets for cylinders for transformers. One of the special advantages claimed is their resistance in hot oils. Their British agent is Mr. Archibald Campbell, of 27, Chancery Lane, W.C.

MR. M. MANSELL notifies that he has purchased the interest of Mr. J. Elliott, his late partner in the business of Elliott & Mansell, electrical engineers and contractors, 12, Soho Street, Oxford Street, W., and is now solely responsible for all debts.

Installation Contracts.—MESSRS. W. J. FURSE AND CO., of Nottingham, have a large number of electrical contracts in hand at the present time in their three principal departments. These include a complete electrical installation at Packington Hall for the Earl of Aylesford, consisting of suction gas plant, generator, and 1,100 ampere-hour battery, electric bells and telephones; for the trustees of the Duke of St. Albans, Bestwood Lodge, a complete installation, consisting of suction gas plant, generator, and 1,000 ampere-hour battery, electric bells and telephones; for the Skegness and Seacroft Hydropathic Co., Ltd., complete installation consisting of suction gas plant, generator, and 600 ampere-hour battery, electric bells and telephones. They are fitting up electric lifts as follows:—For Boots' Cash Chemists, Ltd., Glasgow, electric elevator for seven floors, complete push button control; for the Union of London and Smith's Bank, an electric elevator, two-speed car switch control. Their lightning conductor and chimney department is engaged upon work for the Commissioners of the Admiralty, including at Devonport North Yard Extension, banding pumping engine house chimney with 17 bands, also repairing Gun Wharf chimney, Devonport. For the Midland Railway Co. they are repairing six chimneys, also the St. Pancras Station lightning conductors.

India.—An Indian correspondent informs us that MESSRS. F. & C. OSLER, LTD., have been appointed by Messrs. Thos. Parker, Ltd., Wolverhampton, sole agents for India for the supply of Rees Roturbo Pumps, and have already effected large sales, over 70 Roturbo centrifugals of various sizes having been imported in a year. "For irrigation purposes their suitableness is being recognised by the Government, and in conjunction with them the necessity for a cheap and reliable direct-coupled high-speed crude oil engine is being felt. English manufacturers are seeing to this, and the Americans, too, are on the *qui vive*, and are fully educating themselves to local wants. It is a step in the right direction for large home manufacturers to send out, as they have been doing lately, direct agents to study and report on the conditions obtaining in India."

Dissolutions and Liquidations.—S. HYSLOP & CO., electrical contractors, Santiago.—We are informed that this partnership was dissolved last December, and the business is being continued under the name of "Santiago Hyslop."

HELIS CELL AND ACCUMULATOR CO., LTD.—A petition presented by the Vieille Montagne Zinc Co. (120, Cannon Street, E.C.) for winding up this company is to be heard on May 26th in London.

GARDNER ELECTRIC DRILL AND HAMMER CO., LTD.—This company is winding up voluntarily, with Mr. F. F. Fuller, Salisbury House, E.C., as liquidator.

STEPHEN SELLON & PARTNERS, consulting engineers, 36, Victoria Street, London, S.W.—Messrs. S. P. W. D'A. Sellon & E. M. Sellon have dissolved partnership. The former attends to debts and continues the business.

BERNARD G. JONES & CO., electrical engineers, 33, Commercial Street, Newport.—Messrs. B. G. Jones and G. H. Ingham have dissolved partnership.

BRITANNIA ELECTRIC LAMP WORKS (1905), LTD.—On May 7th this company, meeting at South Tottenham, resolved upon voluntary liquidation, with Mr. J. J. Berryhill Cross, 65, Linzee Road, Hornsey, as liquidator.

GOODFELLOW ENGINEERING CO., LTD.—A meeting is to be held at 2, Booth Street, Manchester, on June 23rd, to hear an account of the winding up from the liquidators (Messrs. J. H. Bayley & J. Carter).

MELDRUM BROS., LTD.—According to the *Financial Times* at an animated meeting of this company, held at Manchester on Tuesday, voluntary liquidation was resolved upon, with Mr. Theodore Gregory, York Street, Manchester, as liquidator. A committee of inspection was appointed.

Bankruptcy Proceedings.—ALFRED W. BENNETT, electrical engineer, late Park Cross Street, Leeds.—Receiving order made May 12th, on debtor's own petition. First meeting, May 25th; public examination, June 16th.

W. A. RODERICK, electrical engineer, Bridgend.—A first and final dividend of 2s. 0½d. in the £ is payable on May 18th at the Official Receiver's Office, 117, St. Mary Street, Cardiff.

E. A. GRAHAM, electrical engineer, Newby, Scarborough.—A receiving order was made at Leeds on May 15th on debtor's own petition. The first meeting is to be held at Leeds on May 28th, and the public examination on June 30th.

LIGHTING and POWER NOTES.

Aberdeen.—In spite of the opposition of the Lord Provost, it has been agreed, by 21 votes to 3, to prepare a return showing the amount of supply, rates charged and average number of hours' demand of each power consumer. Councillor Wilson, who moved the resolution, said he required the information with a view to testing the fairness of the charges made.

Berwick-upon-Tweed.—The T.C. has adopted a scheme to light the main streets of the town with electric flame arc lamps.

Boston.—The B. of T. has revoked the 1906 prov. order.

Bray.—The U.D.C. is recommended by the E.L. Committee to obtain sanction to the borrowing of £4,792 for plant and cable extensions.

Continental Notes. — HUNGARY. — The municipal authorities of Nagzatad have decided on the establishment of a central electric lighting station in the town, and tenders for its construction are shortly to be invited.

Devonport.—The T.C. has decided to equip the remaining four boilers at the electricity works with mechanical stokers at a cost of £1,375. About £400 of this will be spent on materials and labour locally.

Farnham.—The Farnham and District Electric Supply Co. has made application to the B. of T. for consent to the placing of electric lines above ground for the purpose of the supply of energy under its order of 1905.

Greenock.—Negotiations are at present proceeding for a supply of electricity to the Admiralty's torpedo factory at Battery Park. The Admiralty has applied to the Corporation for terms, and though those have been furnished by the T.C. Committee, no decision has been arrived at.

Hampton Wick.—The B. of T. has revoked the 1904 prov. order.

Hornsey.—The L.G.B. has sanctioned the borrowing of £10,000 for the Council's electricity undertaking.

India.—After a good deal of discussion, it has been decided that gas is to be the public street illuminant in Calcutta. Over a year ago tenders were asked for, and it was left open to tenderers to propose any scheme they thought suitable; although the contract had practically a world-wide advertisement, in point of fact only two schemes were put before the City Council: one for electric arc and incandescent lighting by the Calcutta Electric Supply Corporation, and the other by the Oriental Gas Co. Against electricity as an illuminant, the strongest arguments were —(1) Probable failure of supply at any time, thus leaving the city in total darkness; (2) necessity of having the streets "up" for laying mains for the new system; (3) enhanced original expenditure and upkeep, as compared with gas. The City Corporation at any rate made the initial mistake of not having employed an expert to advise it, and to draw up a working specification for the guidance of contractors, and finally to report on the various schemes submitted. The non-technical councillor out East is generally too busy a man to worry over details, which after all do not interest him greatly, and as gas has done fairly well in Calcutta as a street lighting agent, he was content to accept it rather than risk, as he thought, something about which there was a doubt, or at least a controversy. Altogether the public feel that the matter has not been settled in a satisfactory manner, and the question has

been raised whether the Special Committee, who passed the resolution accepting the gas tender, have not acted *ultra vires*.

The Indian Electricity Act is at present being re-drafted and amplified, so as to bring within its scope the conditions which will eventually apply to several large power schemes now under consideration.

The Calcutta Electric Supply Co. is busy laying down extension cables throughout the city and converting the overhead bare copper wire system to that of underground. Callender's "solid system" in earthenware or iron troughing is that which is being adopted.

The Kidderpore Docks are to have a new and complete electric installation at a sanctioned cost of Rs.70,000. Two new steam sets driving multipolar shunt-wound dynamos are to be provided, together with two 26 ft. by 7 ft. Lancashire boilers and the usual condensing and pumping accessories.

Leeds.—The following is a comparison of the results of the past year's work with those of the preceding year:—

	1906-7	1907-8
Receipts from sales for private lighting	£79,251	£80,928
" " " street lighting..	4,536	4,664
" " " power..	24,472	27,846
Total receipts..	108,259	113,436
Working expenses	32,468	35,276
	75,791	78,160
Extraordinary renewals	14,272	13,373
Gross profit	61,519	64,787
Income tax, interest, and redemption fund ..	58,109	57,886
Surplus	3,410	6,921
Units sold..	11,368,956	12,412,861
Average price per unit	2·28d.	2·19d.
Expenses per unit, including extraordinary renewals, interest, and redemption fund	2·21d.	2·06d.
Surplus per unit	0·07d.	0·13d.

The increase in the lighting connections amounted to 3·2 per cent., the units sold per lamp installed being (1906-7) 21·40, (1907-8) 21·25, giving a revenue per lamp installed of 5/6·22, and 5/5·47 respectively. The aggregate horse-power of motors installed at March 31st, 1908, was 8,379, being an increase during the year of 1,499, or 21·8 per cent. The units sold per horse-power installed were (1906-7) 796, (1907-8) 754, and the revenue per horse-power installed, £4 and £3 13s. 2d. respectively.

The revenue from sales of current for lighting purposes was severely affected in the final quarter of the year by the introduction of the new type of lamp.

The recent reductions in the scale of charges for electricity used for power and heating purposes are estimated to affect the ensuing year's income to the extent of about £5,000, without allowing for the increase of business which is likely to result. The revenue had to bear the cost of replacing 700 KW. of plant; the replacement of the whole of the obsolete plant has now been provided for, and the charges for extraordinary renewals in the immediate future will be much smaller than in the past two years. The increased working cost, due to coal, during the past year is calculated to have been £1,336. The actual working cost was ·67d. per unit, the item for coal being ·21d.

A 3,000-KW. turbo-alternator has been installed at the generating station during the year, and after deducting the 83-period plant discarded, as before mentioned, the capacity of the plant is 12,740 KW. An additional turbine set of the same capacity is on order, and expected to be available for use before next winter.

The maximum load upon the plant has been 8,300 KW., compared with 7,470 KW. in the preceding year, and the load factor has been 17 per cent.

Llanelly.—The T.C. has entered into an agreement with the Llanelly and District Electric Light and Traction Co., Ltd., to sell to the latter its electric light order in consideration of the repayment to the Council of the cost incurred in getting the order. The company is to erect a generating station within two years, and also to sell electric energy at stipulated prices. This short agreement enables the T.C. to withdraw its opposition to the South Wales Power Co.'s Bill.

London.—STEPNEY.—The accounts of the B.C. electricity undertaking, which were issued this week, shows the capital outlay on the undertaking to have been £287,960, £22,888 having been spent in the year ended March 31st last. The trading account shows a balance of income for the year over expenditure of £17,102, and an increase in the number of units sold from 4,751,182 to 5,712,684. The total income derived from all sources, minus bad debts, was £41,449. The trading account shows that, compared with last year, the income has increased by £4,457, and the expenditure by the sum of £3,281; the total cost per unit sold has decreased, being ·924d. per unit, as against ·963d. last year. After payment of interest and instalment of loans, &c., the actual surplus for the year remains at £1,928. In considering the amount of profit, it is pointed out that the average income per unit sold for all purposes has decreased from 1·746d. to 1·621d., this being a decrease of 7 per cent.

L.C.C.—The Council has replied to representations from various Borough Councils, asking the central authority to convene a conference to consider the advisability of its introducing next session, a Bill for the supply of electricity in bulk. The L.C.C. expresses the opinion that no useful purpose would be served by convening such a conference at present.

CAMBERWELL.—The petition against, and opposition to, the London and District Electricity Supply Bill has been withdrawn, the promoters having agreed to insert, in Committee in the House of Lords, a clause in their Bill stating that nothing in it shall alter or supersede any rights of the Council under the Electric Lighting Acts or the "Camberwell Clause." The promoters of the London Electric Supply Bill have refused such an undertaking, and the opposition is to be continued, as far as they are concerned, if the town clerk shall see fit.

Nottingham.—In reply to urgent representations of the retail traders in the city, asking for a uniform flat rate of 3d. per unit for lighting, and discounts varying from 2½ to 7½ per cent., according to the amount purchased, the Electricity Committee points out that 491 of the 3,331 consumers already receive an average charge of less than 3d. per unit., and as they represent 46 per cent. of the total output, they would naturally resent any alteration tending to increase the price.

Port Glasgow.—The T.C. has decided to oppose the provisional order which the Greenock T.C. has decided to promote. The principal clause to which objection is taken is that in which the Greenock T.C. seeks power to supply electrical energy (in bulk) water or gas, to any local authority, company, body or person in any district adjacent to the burgh.

Southend.—The profit on the Corporation's electric light undertaking for the past financial year amounts to £2,200, compared with £946 on the previous year's working.

Walsall.—A L.G.B. inquiry was held on May 15th into the application of the T.C. for a loan of £4,000 for electricity purposes, £2,600 being for condensing plant, £1,000 for mains and services, and £400 for meters. There was no opposition.

Willesden.—The Electricity Committee, after considering the report of its chairman, the clerk and the electrical engineer, upon an interview with the officials of the North Metropolitan Electric Power Supply Co., has come to the conclusion that revised terms submitted by the company for energy supplied in bulk should not be accepted. Further negotiations are proceeding.

Windsor.—The T.C. has decided to light the main streets during the next five years with 31 arc lamps, and the side streets with gas. Formerly 284 pairs of glow lamps were used in side streets. The cost of electric lighting under the present arrangement will be £558 per annum.

Yardley.—The terms of the purchase of the South Yardley power station from the Birmingham and Midland Tramway Co. have been approved by the Council. The purchase money is to be paid within three months of receipt of consent from the B. of T. and L.G.B. The plant can remain in its present position for three years; failing removal, the Council will then be liable to a penalty of £100 per month. The Tramway Co. agrees to take energy for all its tramways in the district until the termination of the tramway agreement in 1933, at 1d. per unit, with revision at subsequent dates.

York.—At a meeting of the T.C. on the 12th, it was agreed that an application should be made to the L.G.B. for sanction to borrow £7,200 for mains extensions, &c.

TRAMWAY and RAILWAY NOTES.

Ashton-under-Lyne.—At a meeting of the T.C. on the 14th inst., Alderman T. Hallam reported a further successful year on the tramway system, stating that after setting aside £6,903 for interest, &c., they had a net profit of £969, and with the balance from last year, that would leave a disposable surplus of £1,307. He announced that they were going to run through cars to Manchester *vid* Droylsden, with a half-hour service in the mornings.

Belfast.—At the meeting of the Tramways Committee on the 18th inst., a letter was read from the Cavehill and Whitewell Tramway Co., stating that, having considered the Council's resolution relative to the establishment of a through service between Castle Junction and Glengormely, and also the terms of the Manchester-Oldham agreement *re* the distribution of fares, it was prepared to accept in principle the Corporation's proposal. The question of details, it was suggested, could be left between the manager and a representative of the company, and this was finally decided upon.

Brighton.—When accidents to the universally used electric car meet the eye so frequently, consolation of a kind can be derived from the news that a horse-drawn tramway car, descending a hill at Fishergate, overturned, luckily with only slight injury to five passengers.

Bradford.—The Corporation has succeeded in obtaining a reduction in the assessment of the Corporation tramways in the North Bierley Union to the extent of £787 10s.

Burnley.—The tramway manager, in his annual report, stated that the proportionate increase in receipts of previous years had not been maintained, but there was the substantial increase of 388,460 passengers, and £1,552 in receipts. Parcel receipts showed a satisfactory increase of £53, now amounting to £680 per annum. The growth in traffic necessitated additional rolling stock, and during the year an experimental car had been constructed and was still undergoing trials, the object being to obtain a more economical car

for working special lines than the four-motor equipments now in use. During the year the whole system had been cleared of corrugations at a total cost of £615, the average cost per yard of rail being 2·558d. "There are some signs that the corrugations are returning," he adds; he sees no reason to change his view that the cause lies in the rolling stock, and efforts to deal with the evil on these lines are being continued. The depreciation fund amounted to £32,608, bringing the fund up to the full annual average (£6,000 per annum) required.

Bournemouth.—At the resumed inquiry before the Borough Coroner and Major Pringle, of the B. of T., into the recent tramway accident, the evidence of Mr. Barber, the traffic manager, tended to show that the rear controller was left in such a position as to make the magnetic brakes useless; the driver apparently not knowing or grasping this fact, did not apply the hand brakes until too late for their effective operation. The inquiry was again adjourned until the 27th inst.

Bury.—The Corporation tramway cars last year carried 6,986,930 passengers. The gross receipts were £57,298, an increase of £6,780, and the profit on the Bury section was £4,606, of which £2,500 goes to the relief of the rates. The capital expenditure to date has been £278,880.

China.—The new electric tramway system of the Compagnie Française de Tramways et d'Eclairage Electriques de Shanghai, which extends to 18 kilometres, was put in operation on the 4th inst.

Continental Notes.—GERMANY.—The police authorities of Hamburg have lately put in service an electrical motor ambulance; it is of the Lohner-Porsche type, and is fitted with a 44-cell battery of 186 ampere-hours capacity.

ITALY.—Fifteen passengers were seriously injured at Ivrea in an electric tramway disaster, very similar to that which recently occurred at Bournemouth.

The driver, noticing something amiss, applied the brakes, but in vain, and the car raced downhill at terrific speed, finally plunging over a cliff into a meadow 20 ft. below.

Dundee.—The sum drawn by Corporation cars for the year is the largest in the history of the department. The actual earnings amount to £69,200, or £2,500 more than the receipts last year, and over £800 above the estimated revenue. For the first time this year the policy is to be pursued of taking money from the profit-earning departments of the Corporation, and £1,000 is to be transferred from the tramways to the common good.

Glasgow.—The Bothwell Parish Council has unanimously decided to petition Glasgow T.C. to proceed with an extension of the Corporation tramway system to Bellshill, the route proposed being from Broomhouse *via* Aitkenhead, Tannochside and Bothwell Park, and the distance from the city over seven miles. Mr. James Dalrymple, the manager, and the Tramways Committee of the T.C. have received a deputation on the subject.

Haslingden.—A deputation from the Corporation on May 15th met representatives from Accrington with a view to arrangements being made for the running of the electric cars to and from Haslingden. Accrington offered the service at 7½d. per car-mile for three months, 7¼d. for six months, and for 12 months, 7d., Haslingden to find its own inspectors and take the responsibility for risks to third parties. Finally it was agreed to accept for nine months the price quoted for twelve, and the deputation decided to recommend the Corporation to accept the terms.

Kew.—A Bill promoted by the London United Tramways Co., with the object of obtaining authority for the construction of tramways over Kew Bridge, has been before a Select Committee of the House of Commons. The Committee found the preamble proved, and intimated that, unless the parties agreed before the 20th inst. as to the terms to be paid for running cars over the bridge, an arbitration clause would have to be inserted.

Largs and Wemyss Bay.—The Northern District Committee of the Ayrshire C.C. has received a communication from the promoters of the Largs and Wemyss Bay tramway scheme, indicating that it has been decided by the company to hold the proposal in abeyance for the present, owing to the opposition of the County Council.

London.—L.C.C.—At a meeting on Tuesday several questions were asked as to the condition of the surface-contact system in Mile End Road. In reply, Mr. W. Whitaker Thompson, chairman of the Highways Committee, said that until the system had been sanctioned by the B. of T. and the cars had been run, a report could not be made to the Council. Answering Mr. Gordon, he stated that a horse had come into contact with a stud, but the case was not of a fatal character. In reply to other interrogations, the chairman remarked that an extraordinary escape of gas had occurred from the gas pipes in the Mile End Road. Until they could arrange with the gas company to put its gas pipes in proper condition, it would not be possible to work a complete service of cars. When the conduit system was first inaugurated there were great difficulties and a good deal of sparking, but these had been surmounted.

The Council postponed for a week the consideration of a report by the Highways Committee recommending expenditures of £8,200 for the purchase of that portion of the Lea Bridge, Leyton and Walthamstow Tramways which is situated in London, and of £6,270 for the reconstruction of this section on the overhead trolley system. It is proposed to lease the line to the Leyton Urban D.C. until August, 1911. Estimates of £32,630 for the construction on the conduit system of tramways from Dulwich Library to Forest Hill, and of £70,000 for the provision of rails, were also adjourned for a week.

CITY.—The Improvements Committee, as the result of correspondence with the London County Council on the subject of the improvement of Bishopsgate Street between Angel Alley and the City boundary, has decided to recommend that, on the L.C.C. contributing half the cost of widening the thoroughfare, no opposition should be offered to the construction of a tramway from the City boundary to Middlesex Street.

Newcastle-on-Tyne.—Mr. Ernest Hatton, engineer and general manager of the Corporation Tramways, has just presented to the Committee a return for the year ended March 31st last, showing the income and expenditure on the system. This shows that the tramways had earned £19,478 profit, which, with £1,551 to be utilised in paying the annual instalment in connection with the old horse tramways, makes a total net profit of £21,029 2s. The total working expenses amounted to £116,852, as compared with £107,319 in the previous year. During the year £34,095 was absorbed by interest on loans, and £34,878 was placed to the sinking fund. The total traffic receipts worked out at £205,322; this represents a net average of 11·17d. per car-mile. Last year the receipts were £205,262, and per car-mile 11·56d. During the year £5,371 was received from lighting receipts, as compared with £4,132 in the previous year.

Plymouth.—The T.C. has decided to reconstruct the electric tramway track on Matley Plain (cost £700).

South Shields.—The annual financial report in connection with the Corporation tramways has just been presented, and shows that the total income for the year ended March 31st last amounted to £29,763, while the working expenses were £18,003. The gross profits amounted to £11,759, as compared with £11,901 for the previous twelve months, being a decrease of £141. Out of the gross profits the sum of £5,652 had to be paid for interest on borrowed capital, and the sinking fund charges amounted to £3,224, the total expenditure under this head being £8,875, leaving a net profit of £2,884. At the end of the previous year there was a balance of £4,648, of which £2,117 was absorbed by sinking fund charges incurred before the tramways were producing revenue, the remainder, £2,531, being placed to reserve. The Tramways Committee has decided to recommend that the balance of £2,884 for this year be also transferred to reserve. The past year was the first complete year of working of the entire undertaking.

Weston-super-Mare.—The Electric Supply Co., Ltd., has applied to the B. of T. for an extension of time to June 6th, 1909, for the completion of the tramways.

U.S.A.—Serious rioting has taken place at Cleveland, Ohio, among the employés of the tramway. We understand that the rioters relieved their feelings by cutting down trolley wires and destroying tramcars by means of dynamite cartridges. They did not succeed in wrecking the depôts and offices, owing to the strong force of armed police guarding these buildings.

TELEGRAPH and TELEPHONE NOTES.

Glasgow.—On Saturday afternoon last a new trunk switchroom on the C.B. system was opened in the telephone exchange of the Glasgow Post Office.

Telegraph Conference.—The work of the International Telegraph Conference at Lisbon is being carried on at present by the committees, no plenary sitting having been held since their appointment. Numerous social functions have taken place in the intervals of business.

Telegraphic Interruptions and Repairs:—

CABLES.		INTERRUPTED.	REPAIRED.
Curacao-Coro Curacao-La Guayra Curacao-Maracaibo	Closed	Jan. 12, 1906 ..	..
Tarifa-Tangier		Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)		Mar. 9, 1904 ..	..
Constantinople-Dardanelles		May 18, 1908 ..	May 18, 1908
Las Palmas—Arrecife		May 18, 1908 ..	..
Chio-Tenedos		May 7, 1908 ..	May 12, 1908
Cayenne-Salinas		May 9, 1908 ..	..
LANDLINES.			
Puerto-Barrios		Aug. 2, 1902 ..	..

Wireless Telegraphy.—It is reported that a new trans-Atlantic wireless telegraph service will be opened to the public before the end of this year.

The U.S. Government has recently carried out experiments with balloons in connection with wireless telegraphy.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Perth.—September 7th. 650 telephone wall sets, 150 table sets, various switchboards, other instruments, protectors, &c., for the Postmaster-General's department. Some particulars can be seen at the Electrical Review office.

Melbourne.—May 25th. Flame and ordinary arc lamp carbons for the City Council. See "Official Notices" May 8th.

Melbourne.—August 26th. Installations for wireless telegraphy at the following places:—Cape York, Thursday Island, Goode Island, Port Moresby, Fremantle, required by the Commonwealth Postmaster-General's department. Specification can be seen at the office of the Electrical Review.

Melbourne.—July 3rd. One 500-kw. motor generator, for the electricity supply department. See "Official Notices" May 8th.

New South Wales.—June 10th. 8 tons H.D. copper wire, copper tape binding, 1,300 insulators, 2,000 cross-arms for the Postmaster-General's department, Sydney. Specification, &c., can be seen at the Electrical Review office.

Sydney (N.S.W.).—August 12th. Tenders to Deputy Postmaster-General. Branching metallic multiple magneto switchboard at Mosman. Specification can be seen at Electrical Review office.

Austria.—June 7th. The Austrian State Railway authorities at Innsbruck are inviting tenders for an installation of electric lighting at the railway station at Salzburg.

Belgium.—June 25th. The municipal authorities of the little towns of Amay and Ampsin (Liège) are inviting tenders for the public and private electric lighting of the two communes.

Bolton.—May 25th. The Tramways Committee invites tenders for the painting of the tram poles, bracket-arms and section-boxes.

Brussels.—May 27th. Underground cables for traction. Director-General, Société Nationale des Chemins de Fer Vicinaux, Rue de la Science, 14, Brussels.

Bulgaria.—June 19th. Construction of an electric station for supplying light and power to the Government coal-mines at Pernik. Specification in German can be seen at the Commercial Intelligence Department of the Board of Trade.

Dartford.—June 3rd. Surface condensing plant, for the U.D.C. See "Official Notices" May 15th.

Dartford.—June 9th. Oils, meters, house-service cable, &c., for the U.D.C. See "Official Notices" May 8th.

Dudley.—May 25th. Oils for the electricity department. See "Official Notices" May 15th.

France.—May 30th. The Director of Hydraulic Works of the French Navy, at Toulon, is inviting tenders for an installation of electric lighting at the Naval coal depôt at that port.

France.—June 18th. The municipal authorities of Paris are inviting tenders for the supply and erection at the Colombes sewerage station, at Gennevilliers, of two sets of centrifugal pumps and three-phase electric motors.

Germany.—The municipal authorities of Kreuzwald (Alsace-Lorraine) are about to invite tenders for the establishment of a central electric lighting station in the town.

Glasgow.—Alteration of wiring for Osram or tantalum lamps, for Anderston, Kingston and Springburn Corporation libraries. The Engineer.

Glasgow.—Electric lighting of Corporation new Mitchell Library. Specification being prepared by architect.

Handsworth.—May 25th. Low-tension distributor cables for the U.D.C. Specification at generating station, Soho Road.

Hungary.—June 1st. Tenders invited by municipality of Orsova for installation and operation of electric lighting works for 50 years. Information from Gemeindevor-stand of Orsover. See also *Board of Trade Journal*.

Ilford.—June 10th. Condensing plant, piping, switchboard extensions, &c., for the U.D.C. electricity department. See "Official Notices" to-day.

Kilmarnock.—May 25th. Lancashire boiler for the Corporation electricity works. See "Official Notices" May 15th.

London.—May 26th. Two electrically-driven centrifugal pumps, &c., for the L.C.C. generating station at East Greenwich. See "Official Notices" May 8th.

Penrhiwceiber (Glamorgan).—June 4th. Electric lamps and fittings for a year, for the Penrikyber Navigation Colliery Co., Ltd. The Secretary.

Rawtenstall.—May 29th. Track boosters, low-tension D.C. and high-tension A.C. switchboards, for the Corporation. See "Official Notices" May 15th.

Salford.—May 25th. Cooling towers, tanks, pumps and pipe-work for the electricity department. See "Official Notices" May 8th.

Spain.—The municipal authorities of Villarubia (province of Ciudad Real) have just invited tenders for the concession for the electric lighting of the town during a period of 20 years.

Stockport.—Automatic point-controllers, for the Corporation. See "Official Notices" May 15th.

Walsall.—May 29th. Condensing plant for the Electricity Department. See "Official Notices" May 8th.

Woolwich.—The B.C. is to invite tenders for 6,000 tons of coal for the year commencing June 25th. Of this amount 3,000 tons of washed nuts are required for the Plumstead electricity works, and 1,500 tons of rough coal for the electricity works at Woolwich.

Worksop.—June 2nd. Fuel economiser for the U.D.C. See "Official Notices" to-day.

Worthing.—May 25th. Condensing plant, pumps and piping for the Corporation. See "Official Notices" May 15th.

Yarmouth.—June 2nd. The Tramways Committee is asking for tenders for stores for 12 months, including oils and grease, iron, bolts and nuts, brake blocks, electrical accessories, and miscellaneous stores. Particulars and specification from Mr. F. L. Turner, manager.

CLOSED.

Bexhill-on-Sea.—The T.C. has accepted the tender of Mr. F. A. Greene for a new panel for the switchboard, at £71.

Bradford.—The under-mentioned tenders have been accepted by the Corporation tramways department:—

Hadfield's Steel Foundry Co.—Steel points and crossings, £1,043 10s.
Bayliss, Jones & Bayliss.—Steel tie-bars, £119, and steel bolts, £34.
Forest City Electric Co.—Copper bonds, £118.
United States Steel Products Export Co.—Copper bonds, £179.
Horace P. Marshall & Co.—Pneumatic riveting hammer, £21.

Croydon.—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for renewing the Quin cut-out system, at £483.

Dundee.—The Electricity Committee has placed two contracts for plant in connection with the circulating water pump system, the successful firms being Messrs. Aiton & Co. and Messrs. W. H. Allen, Son & Co. The contracts amount to over £3,500.

Edinburgh.—The contract for 2½-ampere meters for the Corporation for the ensuing year has been placed with the Bastian Meter Co., Ltd.

Glasgow.—The following tenders, being the lowest, have been accepted by the Corporation Works Committee:—

Rubber-covered cables.—Craigpark Rubber Co.
Low-tension cables.—Callender's Cable and Construction Co.
High-tension cables.—W. T. Glover & Co.
Meters.—Chamberlain & Hookham, Ltd., and Ferranti, Ltd.
Carbons.—Sloan Electrical Co.

The Committee has also accepted the tender, at £453, of Messrs. Ferranti, Ltd., for providing and erecting additional switchgear.

Govan.—The following is a list of the successful tenderers for stores 1908-9 for the Burgh Electricity Department:—

Oil.—A. Macqueen & Co., and H. Wells Oil Co.
Red and white lead and graphite.—A. Macqueen & Co.
Engine packings, &c.—Dempster, Moore & Co.
Washed cloths and waste.—Jos. Cookson, Ltd.
Lead-covered and armoured and leadless cables.—British Insulated and Helsby Cables, Ltd.
Rubber-covered cables.—J. A. Rudd & Co.
Cable Accessories.—Veritys, Ltd.
Bitumen, &c.—Craig, Sharp, Ltd.
Meters.—Chamberlain & Hookham, Ltd.
Fuse-boxes.—Keighley Engineering Co.
Wrought-iron tubes and fittings.—David Richmond & Co.
Cast-iron pipes.—David King & Sons.
Arc lamp carbons.—Crompton & Co.
Coal.—John Kennedy & Sons.
Joint-boxes.—British Insulated and Helsby Cables, Ltd.; General Electric Co.; Lancashire Dynamo Co.; and Electric Construction Co.
Motor-starters.—Bray, Markham & Reiss, and Brook, Hirst & Co.
D.P. switches.—E. P. Allam & Co.

Kingston-on-Thames.—The T.C. has accepted the tender of Messrs. Drake & Gorham for a milking tooster, at £41 10s., and for a battery motor, at £12.

London.—Woolwich.—The B.C. received the following tenders for 750 yds. of 3-core cable and 170 yds. of 4-core cable:—

Western Electric Co.	(accepted)	£285
Callender's Cable and Construction Co.		290
Johnson & Phillips, Ltd.		290
W. T. Glover & Co.		293
British Insulated and Helsby Cables, Ltd.		295
Siemens Bros. & Co.		295
W. T. Henley's Telegraph Works Co.		298
St. Helens Cable and Rubber Co.		305

Hornsey.—The B.C. received 13 tenders for feeder cable from the works to Muswell Hill. The lowest price for the complete work was £5,651, while an estimate submitted by the borough electrical engineer for carrying out the work departmentally was £4,986 10s. It was decided to accept the tender of the Western Electric Co. for the supply of the cable at £3,323, the electrical engineer to complete the work.

L.C.C.—The Highways Committee have received the following tenders for the supply (1) of 175 car-bodies, and (2) of the electrical equipment and assembly of the cars:—

1.—Car-Bodies.

		Price per car-body.	Total price.
Hurst, Nelson & Co.	(accepted)	£414	£72,450
United Electric Car Co.		453	79,275
Metropolitan Amalgamated Railway Carriage and Wagon Co.		460	80,500
Cravens, Ltd.		472	82,687
Gloucester Railway Carriage & Wagon Co. ..		479	83,825
Brush Electrical Engineering Co.		483	84,525
G. C. Milnes, Voss & Co.		550	96,250

2.—Electrical Equipment and Assembly of Cars.

		Price per car.	Total price.
British Westinghouse Co.	(accepted)	£316	£55,387
" "	(alternative tender) (not to specification) ..	314	54,950
Dick, Kerr & Co.		337	59,062
Siemens Bros. Dynamo Works		360	63,000
British Thomson-Houston Co.		370	64,750

Eight tenders have been received for the car trucks, and these will be reported on next week. In addition to these tenders, Messrs. Dick, Kerr & Co. offered to supply the cars complete, at the rate of £939 10s. per car. This offer, compared with the total cost per car when taking the lowest of each separate tender, shows a considerable increase.

It is proposed to extend an existing contract with the Frodingham Iron and Steel Co. so as to provide for the delivery of slot and conductor rails for the Dulwich-Forest Hill tramways, the expenditure not to exceed £2,347.

Southwark.—The E.L. Committee received quotations from the following for cable:—

	1 mile ·05.	1 mile ·1.
British Insulated & Helsby Cables, Ltd. ..	£260	£404
Callender's Cable & Construction Co. ..	305	450
Glover & Co.	215	368
Henley's Telegraph Works Co.	253	381
Johnson & Phillips, Ltd.	242	365
Siemens Bros. & Co.	248	370
Western Electric Co. (provisionally accepted)	240	360

Bermondsey.—The B.C. has accepted the following tenders for annual supplies of coal to the electricity department:—

C. J. Cockerell & Co.—Bwllfa coal, 23s. per ton.
Myers, Rose & Co.—Exhall, Ansley Hall, Griff, Ibstock and/or Bugsworth and/or Kingsbury and Baddeley beans, at 14s. per ton, subject to the coal being found on testing to be equal to Kingsbury Ryder beans.

There were 20 tenders for Welsh coal and 92 for Midland or Scotch coal.

Poplar.—At the B.C. meeting on the 14th inst. the following tenders were received for a 1,000-kw. turbo-generator set, to replace a 200-kw. set, in connection with the extension scheme provisionally approved by the Council on March 5th last:—

C. A. Parsons & Co.—
(*a*) Alternator manufactured by General Electric Co., £6,283.
(*b*) Alternator manufactured by Bruce Peebles & Co. (accepted at £5,907 10s. without rotor), £6,365.
(*c*) Alternator manufactured by Siemens Bros., £6,420.
(*d*) Alternator manufactured by Electric Construction Co., £6,593.
(*e*) Alternator manufactured by Dick, Kerr & Co., £6,648.
(*f*) Alternator manufactured by Parsons & Co., £6,901.
Willans & Robinson.—(*a*) £6,444, (*b*) £6,498, (*c*) £6,525 10s., (*d*) £6,731, (*e*) £6,785.
Richardsons, Westgarth & Co.—(*a*) £6,320, (*b*) £6,475, (*c*) £6,500, (*d*) £6,725, (*e*) £6,805.

The Electricity Committee reported that Messrs. C. A. Parsons and Co., whose tender was the lowest, guaranteed the most economical plant, and they would make the spindle, bearings and couplings of the new turbine interchangeable with existing plant. They also stated that various improvements had been effected in their governor gear since their turbines were installed at the Council's works, and the firm offered to bring the governor gear of the existing turbines up to the standard of their latest practice without extra charge. The engineer advised that the order for the turbine should be placed with Messrs. Parsons, having regard to saving in revenue, the lower capital cost, and the engine being practically a duplicate of existing plant. With regard to the alternator, the engineer pointed out that if a Bruce Peebles alternator were accepted a saving on capital expenditure of £457 10s. could be effected by utilising the spare rotor purchased by the Council for use in case of emergency. The installation of a third set of similar manufacture to the existing sets will diminish the necessity for retaining this rotor as a stand-by. The adoption of this proposal would reduce the tender of Messrs. Parsons & Co. to £5,907 10s. The engineer reported that the turbine-generator plant proposed would be capable of giving a continuous load of 1,330 kw. and an overload of 25 per cent. for three hours and 50 per cent. for 30 minutes; and the price was a decided improvement on that paid for the last extension, when the contract price for the two sets was £13,321, and the capacity of each set was only 1,000 kw. continuous and an overload of 20 per cent. The tender of Messrs. Parsons was accepted, subject to the consent of the L.C.C. being obtained for the necessary loan.

The following tenders were received for switchgear at the generating and sub-stations:—

A. W. Penrose & Co.—(*a*) Generating station, £150; (*b*) south sub-station £175; (*c*) new sub-station, £520.
Ferranti, Ltd.—(*a*) £123, (*b*) £181 9s., (*c*) £593 (revised tender).
Siemens Bros.—(*a*) £95, (*b*) £115 10s., (*c*) £634.
Johnson & Phillips.—(*a*) £113, (*b*) £167, (*c*) £594 (accepted).
British Westinghouse Co.—(Accepted for *a* and *b*.) (*a*) £124 10s., (*b*) £213 (*c*) £706.
Whipp & Bourne.—(*a*) £125, (*b*) £215, (*c*) £760.
Electric Construction Co.—(*a*) £155, (*b*) £194, (*c*) £750.
Union Electric Co.—(*a*) £177, (*b*) £172, (*c*) £752 10s.
Cox-Walkers.—(*a*) £179, (*b*) £223, (*c*) £780.
General Electric Co.—(*a*) £180, (*b*) £285, (*c*) £925.

The engineer pointed out that the British Westinghouse Co. recently carried out similar work at Glengall Road sub-station in an entirely satisfactory manner; and as it was not desirable to complicate existing switchboards, he recommended that the company should be given the present contract for the Glengall Road and central stations. With regard to the switchgear to be provided at the new sub-station, the Committee were informed that Messrs. Penrose & Co., whose tender was lowest, were not manufacturers of the plant to be supplied; and the engineer reported that Messrs. Johnson & Phillips, whose tender was next lowest (with the exception of an amended tender of Messrs. Ferranti), had carried out work of a high order for the L.C.C. The Committee added that it was desirable that the converters to be provided at the new sub-station should be similar to those already installed for the Council by Messrs. Bruce Peebles & Co.

Some time ago the Council agreed with the Western Electric Co. for them to supply all cables required for two years at a scheduled rate of prices. In accordance with this agreement, orders are to be placed with the company for cable for High Street (Wade's Place) feeder, and cable for extra-high-tension feeder, at £1,059 and £847 respectively.

Hammersmith.—In reference to the tenders for main switchgear, it was reported here last week that the tender of Switchgears, Ltd., had been provisionally accepted by the Electricity Committee, at £2,014. However, on the matter being further considered by the B.C., it was finally decided to accept the tender of Spagnoletti, Ltd., for the switchboard, &c., at £1,500, and the tender of Cowans, Ltd., at £316 for 20 feeder panels.

Newcastle-on-Tyne.—The Corporation Tramways Committee has accepted the tender of the Tudor Co., at £3,594, for storage batteries.

Newcastle-under-Lyme.—The tender of Messrs. Bagguley & Wood (a local firm) for the supply and laying of 1,010 yards of three-wire mains (£579 10s.) has been accepted by this Corporation. The cable will be supplied by Messrs. Callender, and will be laid under the immediate supervision of one of their engineers.

Portsmouth.—The B.G. has accepted the tender of Messrs. Ashton & Holt, of Ryde, for the electric wiring of the Infirmary extension blocks, at £145.

Rawtenstall.—The Corporation electricity works (through Messrs. Yates & Thom, of Blackburn) have placed an order with Messrs. Ed. Bennis & Co., Ltd., for six stokers and self-cleaning compressed air furnaces for Lancashire boilers.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical tractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERAVON.—Villa residence at Pentylla, for J. Davies, Crown Hotel.
ABERDARE.—Twenty-eight workmen's houses at Cwmbach, and 22 at Godreaman. Surveyor to the U.D.C., Town Hall, Aberdare.
ABERDEEN.—Garage and stores at Thorngrove, Mannofield, for Wm. Jackson, consulting engineer. R. Sharp, architect, Aberdeen.
Alterations to premises in King and Castle Streets for the North of Scotland Bank, Ltd. Walker & Duncan, architects, Aberdeen.
ABERDEENSHIRE.—New houses and alterations on Gordon-Richmond Estates. Mr. Thomson, estate architect, Huntly.
Additions to houses and new stables at Balthaine. W. L. Duncan architect, Turriff.
Hall at Ardallie. J. Campbell, School House, Ardallie, by Mintlaw.
ASHBURTON.—Houses. W. Lear, builder, Ashburton.
ASHFORD (Kent).—Stables for Urban District Council. W. Terrill, borough surveyor.

AYLESBURY.—Secretary's office and boardroom, for the Aylesbury Co-operative Society; houses, New Street, for Webster & Cannon; Queen's Park, for Messrs. Jewell.

BANFF.—Proposed residence and estates office. Wm. Macintosh, Fife estates office, Banff.

BARGOED.—Fire station in Hanbury Road for the Gelligaer and Rhigos District Council. J. P. Jones, surveyor to the Council, Council Offices, Hengoed.

BARNSLEY.—Houses, Granville Street, for W. Rogerson; Clarendon Street and Fife Street, for J. Dunk; Park Grove, for A. Pye; Park Grove, for P. Dalby; Day Street, for T. Lindley; shops, Dodworth Road, for G. Haigh; additions to Kerr Street schools, for the Barnsley Education Committee.

(WORSBOROUGH BRIDGE).—Church parlour and kitchen for the Trustees of the Wesleyan Church. Arthur Whitaker, architect, Saville House, Worsborough Bridge.

Houses at Worsborough Bridge for J. Habbershon. A. Whitaker, architect, Worsborough Bridge, Barnsley.

BARROW.—Salvation Army Hall (£5,300).

BATLEY.—Proposed new shops for the Batley Co operative Society.

BERWICK-UPON-TWEED.—Building scheme, Magdalene Fields; and Hotel for the Border Breweries Co., Ltd. Gray & Boyd, architects, Berwick.

BEXHILL.—Isolation Hospital for the T.C. (£1,600); house, Beaconsfield Road, for H. Carey; alterations to "Bel-Air," Egerton Road, for the Church Army; additions to Cooden House, Little Common, for C. Ward Jackson.

BIRKENHEAD.—Sunday Schools (£1,250). H. Harper, architect, 54, Long Row, Nottingham; P. Rothwell, builder, 174, Conway Street, Birkenhead.

BOURNEMOUTH.—Additions to Boscombe Council School, Haviland and Gladstone Roads. F. W. Lacey, architect to the Education Committee, Municipal Buildings, Bournemouth.

Science and Art Schools at Lansdowne (£25,000). Bournemouth Education Committee.

BOURTON-ON-THE-WATER (GLOS.).—New Baptist Church. W. Cox Howman, architect; Hayward & Sons, builders.

BOLTON.—Additions and alterations at Mawdsley Street Schools, Messrs. Bradshaw & Gass, architects, Bolton; additions to works in River Street, G. Johnson.

BRADFORD.—Warehouse in Longside Lane. W. E. Bickers, architect, Halifax Commercial Bank Chambers, Tyrrell Street, Bradford.

Proposed Public Baths at Wyke. Bradford Corporation Baths Committee.

BRECHIN.—Stores, &c., for the Brechin Agricultural and Trading Co., Ltd.

BROADSTAIRS.—Houses, Albion Road, St. Peter's, for Baxter & Son, builders, Broadstairs.

BROMLEY (KENT).—Houses and stables, Babbacombe Road, Hill & Gurr, builders, 15, West Street, Bromley; houses, Foxbury Road, for F. G. Crickett; Gilbert Road, for W. J. Harrington.

BURNLEY.—Conversion of old Post Office into offices for the Prudential Assurance Co., Ltd., London.

BURNOPFIELD (Co. DURHAM).—Houses (8) and shops for the Co-operative Society. The Secretary.

CAMBORNE.—Houses, Penponds, for Mr. Williams; Eny's Road, for Mr. Opie.

CAMBRIDGE.—Houses, Selwyn Gardens, for Mrs. Digby, Grange House; additions to Selwyn College, for the Master and Fellows; business premises, 93, Regent Street, for the Misses Rae, Grantchester.

CARDIFF.—Bottling stores for the Anglo-Bavarian Brewery, Ltd. E. G. C. Down, architect, 31, High Street, Cardiff.

Laundry, for St. Andrew's Place Cookery School, University College. E. W. M. Corbett, architect, Castle Street, Cardiff.

Alterations and additions to property in Mill Lane, for the South Wales Model Homes, Ltd. James & Morgan, architects, Charles Street Chambers, Cardiff.

Public hall and garage, corner of Paradise Place and Ebenezer Street. Mr. Stibbs, architect, Cardiff.

Rebuilding Globe Hotel. James and Morgan, Charles Street Chambers, Cardiff.

Six houses in Llanishan Street, for Hy. Coffin. Veall & Sant, architects, Cardiff.

Six houses in Amesbury Road, for J. Galsworthy. W. H. Scott, architect, Cardiff.

Warehouse in Wood Street for Josephs & Co. E. W. M. Corbett, architect, Castle Street, Cardiff.

CARNFORTH.—Semi-detached houses, for Buttle and Jackson. Harrison, Hall & Moore, architects, 73, Church Street, Lancaster.

CARSHALTON.—Houses, Grosvenor Avenue, for A. B. Cock; Banstead Road, for J. Peto.

CHARD.—Fitting shop for Gifford, Fox & Co. Symes & Madge, architects, Chard.

CHESTERFIELD.—Houses, High Street, Clown, for W. H. English; Barton Street, Clown, for J. Malvin; Barton Street, Clown, by R. Bradley; Baxton Moor, for S. Godley.

CHICHESTER (SOUTHBOURNE).—Prospective rebuilding of villa recently destroyed by fire. A. Jones, occupier.

CLAPTON (GLOUCESTERSHIRE).—New Baptist Church.

CLIFTON (YORKS.).—Proposed parish hall and church institute. Vicar of the Church of St. Philip and St. James.

COLCHESTER.—Proposed new abattoir and conveniences. Local Co-operative Society.

Extension to the Infirmary for the Guardians. C. E. Butcher, architect.

COVENTRY.—Elementary school in Broad Street (accom. 800), also new school at Earlsdon, and enlargement of Radford School. Coventry Education Committee.

COYCHURCH (BRIDGEND).—Proposed public hall and library to be lit by electricity.

CROYDON.—Church, Warwick Road. E. J. Saunders, builder, Wellesley Road, Croydon.

Houses and shops, London Road. C. S. Peach, architect, 28, Victoria Street, S.W.

Eleven houses, Denmark Road. H. W. Hillman, architect, 28, Martin's Lane, E.C.

DARLINGTON.—Houses, Lowson Street, for G. Dickinson & Son; Oak Dene Avenue, J. Guthrie & Son, builders, Corporation Road; near Fairfield Street, for Clark & Mosorop; premises in Priestgate and Crown Street for the *Northern Echo* Co.

DARTON (near BARNSLEY).—New brewery for Geo. Hall.

DENBY DALE (YORKS.).—Houses, Norman Road, for T. D. Matthews; Wakefield Road, for Lazarus Schofield.

DENTON.—Additions to hat factory, for Jonathan Moores & Sons; additions to hat factory for Joseph Howe & Sons; houses, York Road, for Ernest Richardson.

DEWSBURY.—Additions to Hope Oil Works. J. Firth & Son, architects, Vulcan Road, Dewsbury.

DUNDEE.—Villas in Lammerton Terrace, for J. Black; warehouse in Seagate, for the Scottish Co-operative Wholesale Society, Ltd.

Proposed Peters electrical engineering laboratory at the University College on Union Mount. Mills & Shephard, architects.

DUNFERMLINE.—Library at Baldridgeburn. J. Stewart & Sons, builders, Dunfermline.

DUNGIVEN (LONDONDERRY).—Alteration and extension of the Presbyterian Church. Rev. A. Gibson, Chairman of the Committee of the Church, Dungiven.

DUNMOW.—Proposed bacon factory for the Dunmow Flitch of Bacon Co. (a new concern with £20,000 capital); W. Wade, solicitor, Dunmow.

DUNMURRY (Co. ANTRIM).—New parish church.

DURHAM.—Infants' school at Chilton, Ferryhill, and alterations at Chilton and Page Bank Schools, for the County Council. C. Johnston, architect, Victoria Street Chambers, Bishop Auckland.

EARSDON (NEWCASTLE-ON-TYNE).—Twenty-two houses at Backworth.

ELMWOOD (IRELAND).—Hall in connection with All Souls' Church. W. J. Gilliland, architect, 9, Howard Street, Belfast.

ELTHAM.—Alterations and additions to building, Court Road. W. Pollock, builder, West Park, Eltham.

Additions to 47, Westmount Road. J. E. Edwards, 48, Wellington Road, Charlton.

ENFIELD.—Proposed factory at Ponder's End for Ellmus Waterproofing Co.

EPSOM.—House and garage, East Street, for A. E. Harter.

EXETER.—Proposed enlargement of the West of England Eye Infirmary, for the Governors (£3,000).

FALKIRK.—Shop and other premises for trustees of late J. Wilson. J. Wilson, solicitor, agent.

Camelon gymnasium extension. T. C. Wade, solicitor, agent.

Extension of premises for A. Young, china merchant.

FALMOUTH.—Six houses in Marlborough Road, for Eva & Bone, builders, Falmouth; re-building business premises, for J. Burton, Church Street, H. E. Tresidder, architect, Falmouth; three houses for Mr. Johns, at Flushing, L. Winn, architect, Truro; two houses at Flushing, for R. Hitchins; bungalow at Mylor, for F. Fairburn, E. H. Moss, architect, Falmouth.

FERRYHILL (Co. DURHAM).—Baptist Church at Deanbank (£1,200).

FISHGUARD.—Twenty houses for the trustees of the Vergam Building Club. A. B. Williams, solicitor, Fishguard.

FOLKESTONE.—Proposed Parish Hall and Boys' Club.

FRINTON-ON-SEA.—Houses, Second Avenue, for S. C. Turner; house and shops, Connaught Avenue, for T. Smith.

GELLIGAER (near CARDIFF).—Houses, Bedlinog, for Rollings and Morgan; Bedlinog, for the Bedlinog Building Society; Bedlinog, for Lewis Edwards; Bargoed, for E. Winstone; shops at Ystrad Mynach, for Jas. Jackson.

GILLINGHAM (DORSET).—Shops, dwelling house, &c. W. Slade & Sons, general stores, Gillingham, Dorset.

GILLINGHAM (KENT).—Church (£5,400). J. E. K. and J. P. Cutts, architects; West Bros., builders, 131 and 137, High Street, Rochester.

GIRVAN.—Sawmill at Lagganwhilly, adjoining the railway station.

GLAMORGANSHIRE.—New schools for the C.C. at Blaengwynfi; Aber, (Ogmore Vale); and Heolyciw.

GLASGOW.—New St. Peter's Church, Boquhanran, Radnor Park (£2,300); workshop, for J. F. Leggat & Co., engineers, 94, Dobbie's Lane; extension to the Technical College in George Street and John Streets; alteration and additions to the Crown Iron Works, North Woodside Road, for L. Sterne & Co., Ltd.

(NEWLANDS).—Eleven houses in Kilmarnock Road, for G. Eadie, 405, Mathieson Street, Glasgow.

GLOSSOP.—New Conservative Club premises. Messrs. Eaton, architects, Ashton-under-Lyne.

GLYNCORRWG (PORT TALBOT).—Three fire stations for the U.D.C. W. P. Jones, surveyor, Council Offices, Cymmer, Port Talbot.

GRANTHAM.—Houses, Harrowby Road, for H. H. Bowler.

GRAVESEND.—Theatre, Princes Street, for D. Hart, W. Gould, architect; houses, Ferndale Road, for W. Badman, L. F. L. Bridgland, architect; Northcote Road, G. F. Tuffee, builder, Pelham Road, Gravesend; detached residence, Park Avenue, for Mrs. Russell, Bridgland and Clay, architects; electrical sub-station at Rosherville for the T.C. Borough surveyor.

HABROUGH (LINCS.).—Church Institute. Rev. C. C. Marris, Habrough Vicarage.

HALESWORTH (WISSETT).—New schools for Suffolk C.C. Gibbs & Rodwell, builders, Saxmundham.

HARPENDEN.—Houses, Moreton Avenue, for Mr. Pinnington; Ox Lane, for Geo. Coburn, Cowper Road.

HARROGATE.—Houses, Bilton Grove Avenue, for C. A. Wettleton, builder, Balmoral House; Rutland Road, for A. Fotheringham; Dragon Parade, for J. Chippindale.

HARROW.—Iron school for Baptist Church. McKilliam & Proctor, architects, 83, St. Paul's Churchyard, E.C.

HEBDEN BRIDGE.—Residence, coach house and stable at Crosslanes. Sutcliffe & Sutcliffe, architects, New Road, Hebden Bridge.

HEREFORD.—Alterations to Lloyd's Bank. T. W. Allen, manager.

HESWALL (CHESHIRE).—Elementary school for the Hoylake and West Kirby District Education Sub-Committee. Deacon & Horsburgh, architects, 12, St. George's Crescent, Liverpool.

HEXHAM.—New Presbyterian Church. Orwin & Spurgin, architects.

HOLYHEAD.—Additions to the County School. J. Owen, architect, Exchange Chambers, Holyhead.

HUDDERSFIELD.—Extension of Ashbrow Mills, Fartown. A. Shaw, architect, Golcar.

HULL.—New premises, New Bridge Road, for the local Co-operative Society.

HYDE.—Houses, Church Avenue, Gee Cross, for A. B. Wilkinson; Lodge Lane, for Wm. Hibbert; Muslin Street, for H. Peart; Grosvenor Road, for Wm. Norgrove & Sons; Bredbury Street, Newton, for Wm. Ratcliffe.

IDLE (YORKS.).—Development of estate of Sir Angus Holden. A. Dickinson and Sons, builders, Idle.

ILFORD.—Houses, Clarenden Gardens, for Griggs & Co., Ltd.; Coventry Road, for C. Healing; New Road, B. Hart, builder, 10, New Road.

ILKLEY (YORKS.).—Additions to Co-operative Stores. J. W. Fawcett, secretary, 10, Albion Street, Ilkley.

INVERKEILOR (FORFARSHIRE).—Additions to Public School. J. Sim, architect, Montrose.

INVERNESS.—Additions to National Bank Buildings (£1,500). The manager, National Bank, Inverness.

IRLAM (LANCS.).—Houses, Caroline Street, for A. Boothby; Silver Street, for Jos. Royle; Lynton Avenue, Cadishead, for J. H. Kay; Liverpool Road, for F. Barrington.

ISLEWORTH.—Parish Hall in Spring Grove. Mr. Franck, architect.

KENDAL.—Rebuilding Masons' Arms Inn, for the trustees of the Ralph Ford Hall Estate. J. Hutton, architect, Kendal.

Additions to Fellside Schools. Stephen Shaw, architect, Kendal.

KIVETON PARK (near SHEFFIELD).—Houses, Lorden's Hill, Dinnington, for J. W. Revill; Starch-houses, for G. W. Sikes; Dinnington (86 houses), for Messrs. Green.

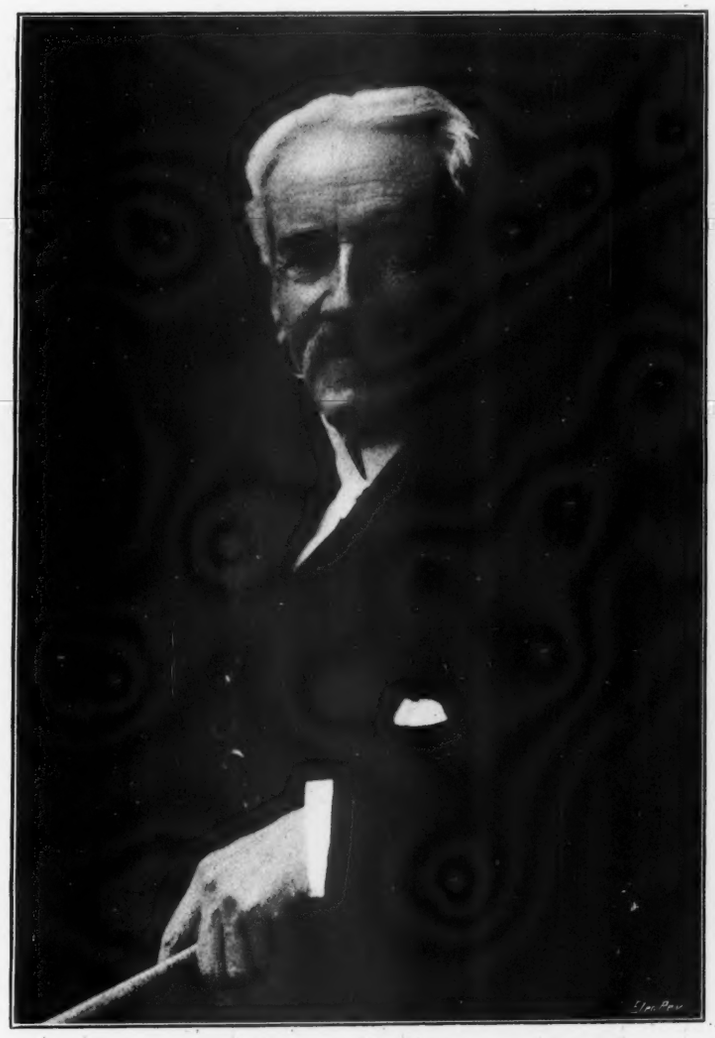
LEICESTER.—Guild Hall, education centre and surgery for the Leicester Cripples' Guild (£2,000).

LINCOLN.—Additions to the City Infectious Diseases Hospital, Long Leys Road. R. A. MacBrair, City Surveyer, Corporation Offices, Lincoln.

(*Continued on page* 873.)

FRANCIS HUGHES WEBB.

At Hampstead Cemetery yesterday afternoon there were laid to rest the remains of Mr. Francis Hughes Webb, who passed away on Sunday last at the advanced age of 84 years. As most of our readers are aware, Mr. Webb rendered faithful and important service from 1878 to 1898 as secretary of the Institution of Electrical Engineers. During those 20 years there was witnessed a great advance in the applications of electricity, and the evolutionary developments that electrical engineering was then making necessitated changes in its representative institution. In 1881 the old Society of Telegraph Engineers changed its name by adding the words "and of Electricians," and it was two years later that the organisation took the new title, which it still retains. From that date onward the additions to the membership were continuous right up to the time of Mr. Webb's retirement, when he handed over the reins of secretarial office to the late Mr. W. G. McMillan, with 3,000 names enrolled in the various classes of membership. He had entered upon his duties in a day of small things, a man of already ripened experience in telegraph, railway, and engineering matters, at the age of 54 years. Year by year the work of the secretary's department naturally became heavier, and when he retired ten years ago, at the age of 74, it was considered by everybody that it was to a well-earned rest.



Francis Hughes Webb.

Speaking at a meeting of the Institution at which a pension was voted, a member expressed a hope that Mr. Webb might live to see a membership of 5,000 "in a house of our own." The hope as to membership has been more than fulfilled, but our great Institution is still homeless and a wanderer.

In June, 1897, a complimentary dinner was given in his honour at the Whitehall Club. The gathering was a thoroughly representative one, and the late Lord Kelvin was in the chair. In the following February the presentation took place in the same building, and we cannot do better than quote from the terms of the illuminated address which was then handed to Mr. Webb by Sir Henry Mance, who presided. It was signed by 1,000 contributors to the testimonial fund, and it was accompanied by a cheque for upwards of £600, and a diamond brooch for Mrs. Webb, now also deceased. The address ran :—

"For 20 years you have devoted the whole of your untiring energy to that office (the secretaryship) with a single mind to the interests of the Institution; and the increase in the number of members during these years, from 800 to 3,000, coupled with the soundness of the financial position to which the Institution has attained in the same period, sufficiently attest the value and the success of your labours. In conducting the work of the office, your uniform and unfailing courtesy, tact, sympathy and kindliness, have endeared you to all with whom you have been brought into contact."

In these words we have an expression of our own sentiments as editors of the Electrical Review, for, in the many ways in which an Institution secretary can assist the technical Press, Mr. Webb was a gentleman with whom it was a pleasure to have relations.

Major-General Webber, one of the founders of the Institution, who was one of the speakers on the occasion of the presentation, referred to the fact that Mr. Webb had served under 19 presidents.

Mr. Webb had a soul for music, and in all matters relating to cricket he took a very keen interest; even in recent years, whenever able, he was to be seen watching the play at Lord's. For a long time, however, he had been a sufferer from Bright's disease, and it was from the effects of this that he passed away, heart failure being the immediate cause.

On our own behalf, and on that of the electrical profession, we tender to the bereaved relatives very sincere sympathy.

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A LARGE GAS ENGINE AT WREXHAM.

The Brymbo Steel and Iron Works, near Wrexham, have for some time been using two vertical gas engines of 500 B.H.P., and since March of last year a further gas engine of 900 B.H.P. has been in use. The latter engine, which is shown in our illustration, is directly coupled to a three-phase generator, for supplying energy at 330 volts pressure, and 42 periods, to the various motors at the colliery, coke ovens, blast furnace, steel works, &c., while for use at the more distant points for pumping, basic slag grinding, &c., it is transformed up to 3,000 volts pressure. The large gas engine is of the double-acting four-cycle type, with tandem cylinders, the diameter of the two cylinders being 30 in., and the stroke $35\frac{7}{8}$ in. ; the engine gave a continuous output of 900 B.H.P. while under test.

All the engine parts exposed to heat strains have been designed on simple and symmetrical lines, and special regard has been paid to the use of cooling water, the cylinder jackets being designed so that slime cannot remain at those corners which may be exposed to heat strains, whilst a further advantage obtained is that the jackets may be easily and expeditiously cleaned.

The cooling water is used at a pressure of about 70 lb. per sq. in., being pumped from a stream up to a reservoir, from which it runs back through the cylinders, covers and the exhaust valves of the engine, and is then pumped again up to the reservoir. The hollow pistons are fitted with self-tightening cast-iron rings, and the rods which carry them are supported by outside cross-heads.

The piston rods are supported in movable metal stuffing boxes ; each side of the cylinder has a gas inlet and exhaust valve, worked by one shaft, through eccentrics, and regulated by a trip-valve gear, which, under the influence of the governor, varies the amount of gas in the gas-air mixture, when the load is altered.

The gas mixture is ignited electrically ; a timing device being fitted, which can be operated whilst the engine is running. The engine is started by means of compressed air, supplied from either a horizontal or a vertical compressor, the former being driven by a single-acting gas engine and the latter by a three-phase motor. The air is compressed up to 200 lb. per sq. in., and stored in four receivers.

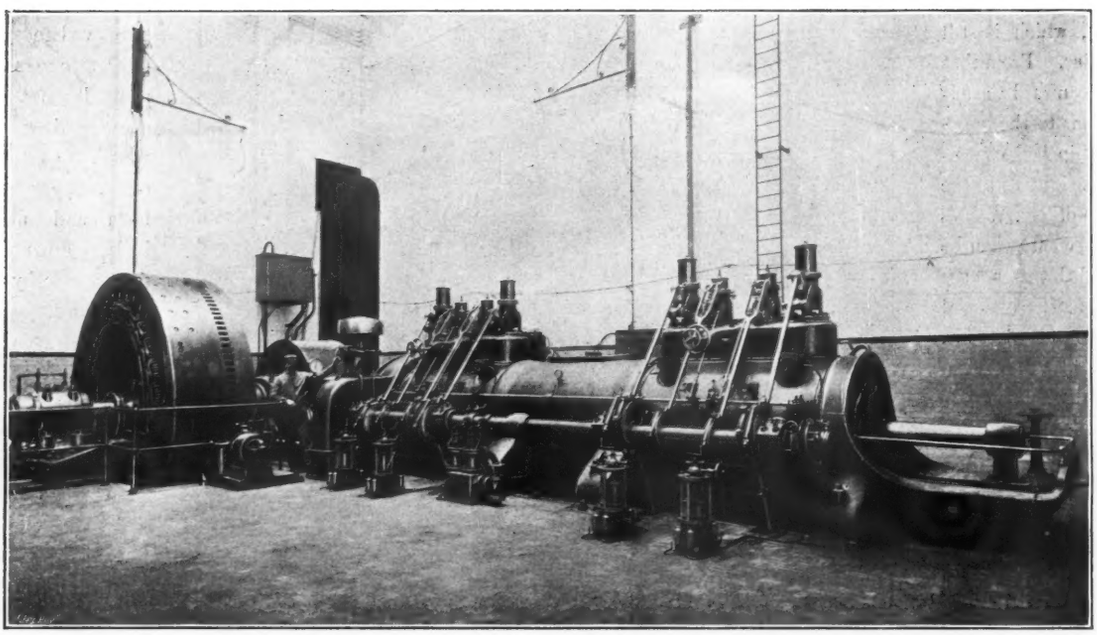
The engine gas is a mixture of 10 per cent. of coke oven gas, and 90 per cent. of blast furnace gas. The furnace gas is derived from a furnace delivering 120 tons pig-iron per 24 hours ; this is provided with a single bell, and the gas, after leaving it, enters a very large dust catcher, from which the dust is withdrawn every other day.

From the dust catcher the gas passes through a main 164 ft. long into condensers, consisting of 18 vertical wrought-iron pipes, 15 in. dia., and 46 ft. high.

The coke oven gas pipe joins the blast furnace gas pipe before it enters the condensers. The gas leaves the blast furnace at a low temperature, so that there is no necessity to inject water into the condensers, except occasionally to remove any accumulation of dust.

After leaving the condensers the gas is washed in a Theisen washer and then goes directly to the engines.

Consequent upon the scarcity of water in the neighbourhood of the Brymbo works, the water in this installation is used several times over in the washer for a period of a fortnight. The dirty water flows from the Theisen apparatus to settling pools, and the clean water is pumped through an elevated tank, from which it flows once more to the Theisen washer. In this manner the actual consumption of water for cleaning is only 0·25 litre per cb. m. of gas, and for circulating the quantity is 1·75-2 litre per cb. m. of gas.



900-B.H.P. Tandem Gas Engine at the Brymbo Steel and Iron Works.

The cleaning is very effective, inasmuch as the contents of dust in 1 cb. m. of gas amount to only 0·013-0·007 grammes. A continuous run of seven months (Sundays excepted) has been made with the gas engine.

One cb. metre of the coke oven gas has been estimated to contain about 2·50 to 3·00 grammes of sulphur ; to remove this sulphur, which has an injurious effect on the exhaust pipes, a special purifying plant is installed, which reduces the sulphur to under ·025 gramme per cb. metre.

Each time the blast furnace bell is lowered, the pressure of the gas falls from 4·5 in. water to zero, rising again as soon as the bell is closed, but notwithstanding this the engine has run very regularly and the governor alone has been able to deal with all the variations of gas pressure and composition. The calorific value of the mixture is 125 to 135 B.TH.U. per cb. ft.

If a tuyere at the blast furnace has to be changed and the

blast taken off, air is admitted to the furnace through the tuyere spyholes and the bell being closed, the furnace acts by virtue of its natural draught as an ordinary gas producer, supplying the engine. The latter was constructed and erected by the United Augsburg and Nuremberg Machine Works, of Nuremberg.

With the exception of a steam engine for the blowing plant and one for the rolling mill, there is no other steam driven plant now in operation at the Brymbo works.

ELECTRICALLY-DRIVEN SAWMILLS.

The sawmills and timber sheds of Messrs. J. & W. Bellhouse, Miles Platting, Manchester, form an interesting example of the modern application of electric motors to the driving of wood-working machinery. The sawmills are situated on the banks of the Bridgewater Canal, and were established in 1792, so that the firm can claim to be one of the oldest in the trade.

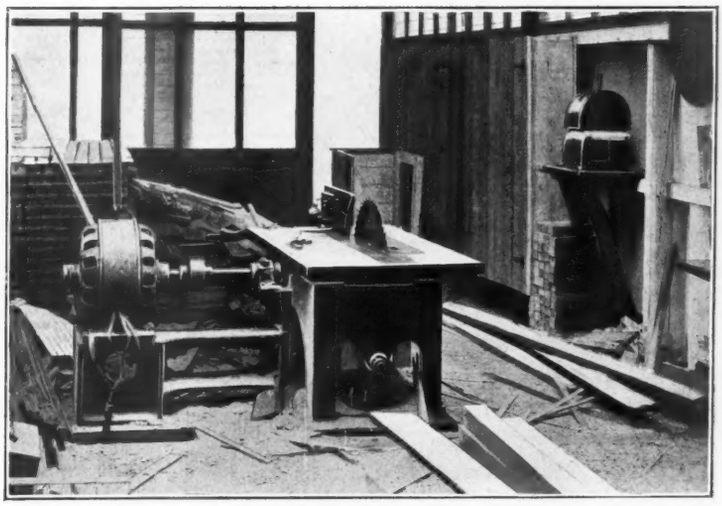


Fig. 1.—Showing Application of Westinghouse Motor and Switchgear to Circular Saw Bench.

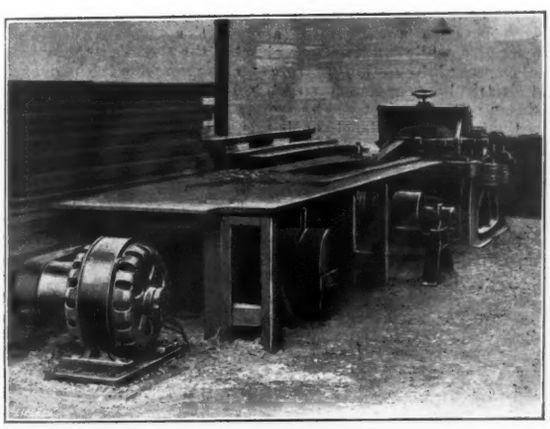


Fig. 2.—Four-Cutter Moulding Machine driven by 20-h.p. Westinghouse Motor.

Up to July of last year they depended for their motive power on a steam engine and lines of overhead shafting, with belts therefrom to the various machines. During the past few years the firm have been fully convinced of the many advantages to be gained by the adoption of electricity as the motive power; but, owing to the capital represented by their steam power plant, they were reluctant to make the change-over.

In July of 1907 a disastrous fire burnt the mills to the ground, and the steam plant was destroyed. Recognising, as they had done for some time, the superior advantages of the electric drive, they at once provided that their new sheds should have a complete electrical installation. The result is a thoroughly up-to-date equipment, with all machines individually driven by electric motors, and the whole factory electrically lighted. The plan of driving each machine by its own motor has many advantages over the more common method of "group driving." Perhaps the chief advantages of the system are its economical use of power and its flexibility, the latter being an important feature which, as all users of electric motors agree, is not obtainable with other drives.

Messrs. Bellhouse's mills consist of two sheds or buildings, one of which is the joiners' shop (containing no machinery), and the other building contains the sawmill and joiners' machine shop. Fig. 3 shows a general interior view of the joiners' machine shop. A comparison of these pictures with similar pictures of shops using steam engines and shafting for the driving of the saws and other timber-working machines, will show the marked improvement effected by the absence of shafting and belts from the walls. Moreover, there is no necessity to make the walls of such heavy and solid construction, thus effecting an economy in the building cost which would amount to a considerable sum in a large plant.

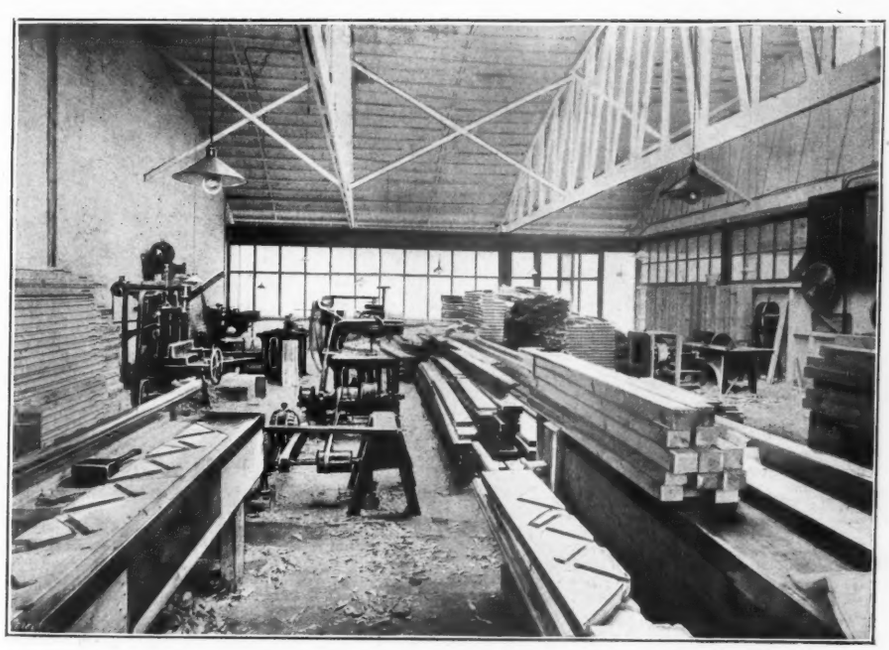


Fig. 3.—General View of Electrically-driven Machinery; Joiners' Machine Shop.

The contract for the supply of the electric motors was placed with the British Westinghouse Co., the motors installed being of their alternating-current three-phase squirrel-cage induction type, except in one or two cases, where motors of the Lancashire Dynamo and Motor Co.'s make were supplied with the machines. The total capacity of the motors installed exceeds 280 h.p., the sizes ranging from 1 to 50 h.p.

The squirrel-cage induction motor is essentially a constant-speed machine, so that in some cases where several speeds are required, the motor is connected to the machine through counter-shafts,

with different sized pulleys for obtaining the necessary range of speed. The motors are very simple, and in the case of the larger sizes are started by means of auto-starters (one of which can be seen on the bracket to the right of the circular saw in fig. 1), the handles of which are first moved to the starting position, when a reduced voltage is applied to the motor; on moving the handle from the starting to the running position (which is done as the motor attains a fair speed) the full voltage is applied to the stator of the motor, which will then run up to its full speed. In the case of motors

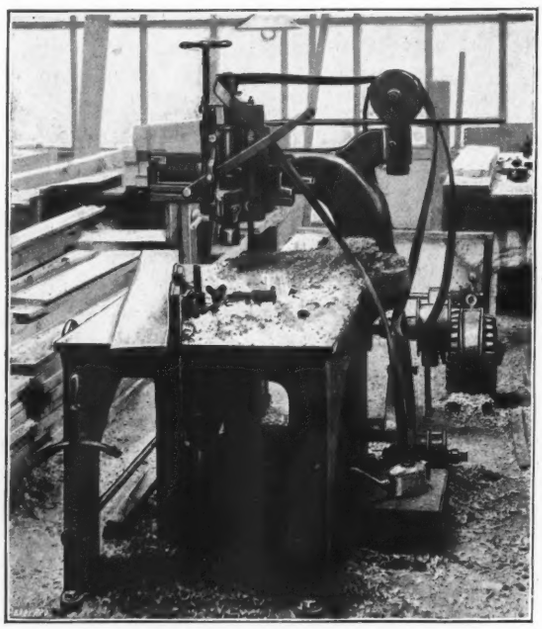


Fig. 4.—Spindle-Housing Machine and Motor.

below 5 H.P., an ordinary knife-switch is frequently all that is necessary for starting up, the motors being put straight on to the line.

The high-tension feeders of the Manchester Corporation are brought into the private sub-station, which contains two 250-KW. Westinghouse three-phase reducing transformers and a Ferranti three-panel, enamelled-slate switchboard. The transformer reduces the voltage to 420 volts, at which pressure the motors are operated, and the switchboard contains the necessary apparatus for controlling and recording the energy supplied to the motors. A distributing switchboard is installed in the sawmill for recording the power consumption of, and for controlling, the various sections of the plant.

The sawmill contains several large wood-working machines, each being driven by its own motor. Fig. 2 shows a 20-H.P. motor driving a 12-in. × 4-in. four-cutter moulding machine. In addition to this, there are several other large and important machines in the same shed, including a 12-in. × 5-in. four-cutter moulding machine (35-H.P. motor); two self-feeding circular saws (30 and 35-H.P. motors respectively); a 24 in. × 6 in. deal thread machine operated by a 15-H.P. motor; a band-saw machine driven by a Lancashire Dynamo and Motor Co.'s 50-H.P. motor, the carriage being operated by one of the same company's 7-H.P. motors; a cross-cut saw (10-H.P. motor); and a tool grinder operated by a 2-H.P. motor.

One portion of the sawmill is partitioned off for saw sharpening and setting, and contains a circular saw sharpening machine, and a band-saw sharpening machine, each being driven by its own 1-H P motor. The motors for the cross-cut saw, self-feeding circular saws, 12 in. × 5 in. moulding machine and the deal thread machine are all in the cellar beneath the shed, the belts being taken up through holes in the floor. This has the decided advantage of leaving the working floor comparatively free from obstructions.

The joiners' machine shop contains several smaller machines, including a circular saw driven by a 10-H.P. motor (fig. 1); chain mortising machines, driven by a 7½-H.P. motor; jacker, dove-tailing and automatic-grinding machines, each with its own 3-H P. motor; spindle-housing machine driving by a motor of 5 H.P.; (fig. 4); and a tenoning machine driven by a 10-H.P. motor and illustrated in fig. 5,

Occupying part of the space beneath the sawmill is an artificial drying chamber, heated by steam piping from a large boiler at one end of the shops. For the purpose of rendering the temperature of the chamber slightly lower when it is necessary for men to work therein, a large fan driven by a 4-H.P. motor is fitted into one of the walls. This fan reduces the temperature of the room in a very short time so that men can go and work there in comfort.

For the rapid and easy handling of the huge logs of timber which daily pass through the yard, and for the unloading of the timber barges on the Bridgewater Canal, a 6-ton overhead travelling crane has been installed by Messrs. Craven Bros., of Manchester, which runs along the side of the machine sheds and overhangs the canal. This crane is equipped with one 2-H P. and two 10-H.P. A.C. squirrel-cage motors.

The factory is busy at present with a large contract with Messrs. Craven & Markham for the Great Central Railway Co. In addition, the firm carries out work for builders and contractors, and with the present up-to-date plant it is in a position to undertake such work much more quickly and with far greater ease than before.

ELECTRO-METALLURGY OF ZINC.

The present methods of reducing zinc are far from ideal, and any improvement in these processes must of necessity be of great utility. For some years past Mr. Gustave Gin has been endeavouring to introduce a more economical procedure, and the results of his investigation have been communicated to the American Electro-chemical Society. After numerous trials the induction furnace was found to give the best results. In order to procure an efficient circulation, the ordinary type of furnace has been modified by using as a crucible a series of channels, the bottoms of which are inclined longitudinally, the deepest part of each being connected by a conduit to the more shallow part of the next. The channels have a relatively large section, so that the fused material, while filling completely the conduits, occupies only a part of the sections of the channels themselves. The quantity of electrical energy transformed into heat varies inversely with the section of the conductor; the molten mass is for this reason cooler in the top parts of the channels than in the other extremity. By reason of the difference of temperature, and consequently of density, there results an ascensional movement of the liquid in the connecting conduits, reinforced by a further heating in the conduit itself, and for this reason producing a general circulation throughout the whole mass, forming the secondary circuit. Such an arrangement as this must have a limited application, for it is quite conceivable that the "pinch effect" will set in with the very narrow conduits in use. Beyond this, the furnace itself shows very little new. The induced current is conducted through iron mixed with the ore and the conductor may be utilised further to reduce the oxide of zinc to the metallic state. For protection against radiation, water cooling in used round all insulated parts. The lining of the furnace is composed of burnt dolomite, agglomerated by pitch and stamped in like the hearth of the Siemens-Martin furnace. The roof is made of bricks of burnt magnesite, the contraction of which is practically nothing. The bath or iron being at a suitable temperature, there is spread upon its surface a mixture of the oxide of zinc and carbon, or the sulphide of zinc, lime and carbon. After charging, the working door is quickly closed and the joints plastered with clay. Continuing the heating, the temperature of the mixture is raised rapidly and the distillation of the zinc commences. In a furnace with a thermal efficiency of 65 per cent. the energy required per ton of reduced zinc from the oxide is 2,472 KW.-hours, from the carbonate 4,330 KW.-hours, and from the sulphide 2,965 KW.-hours.

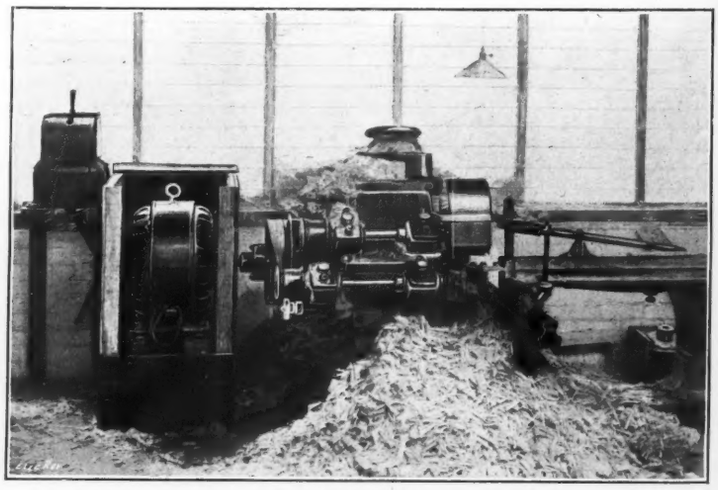
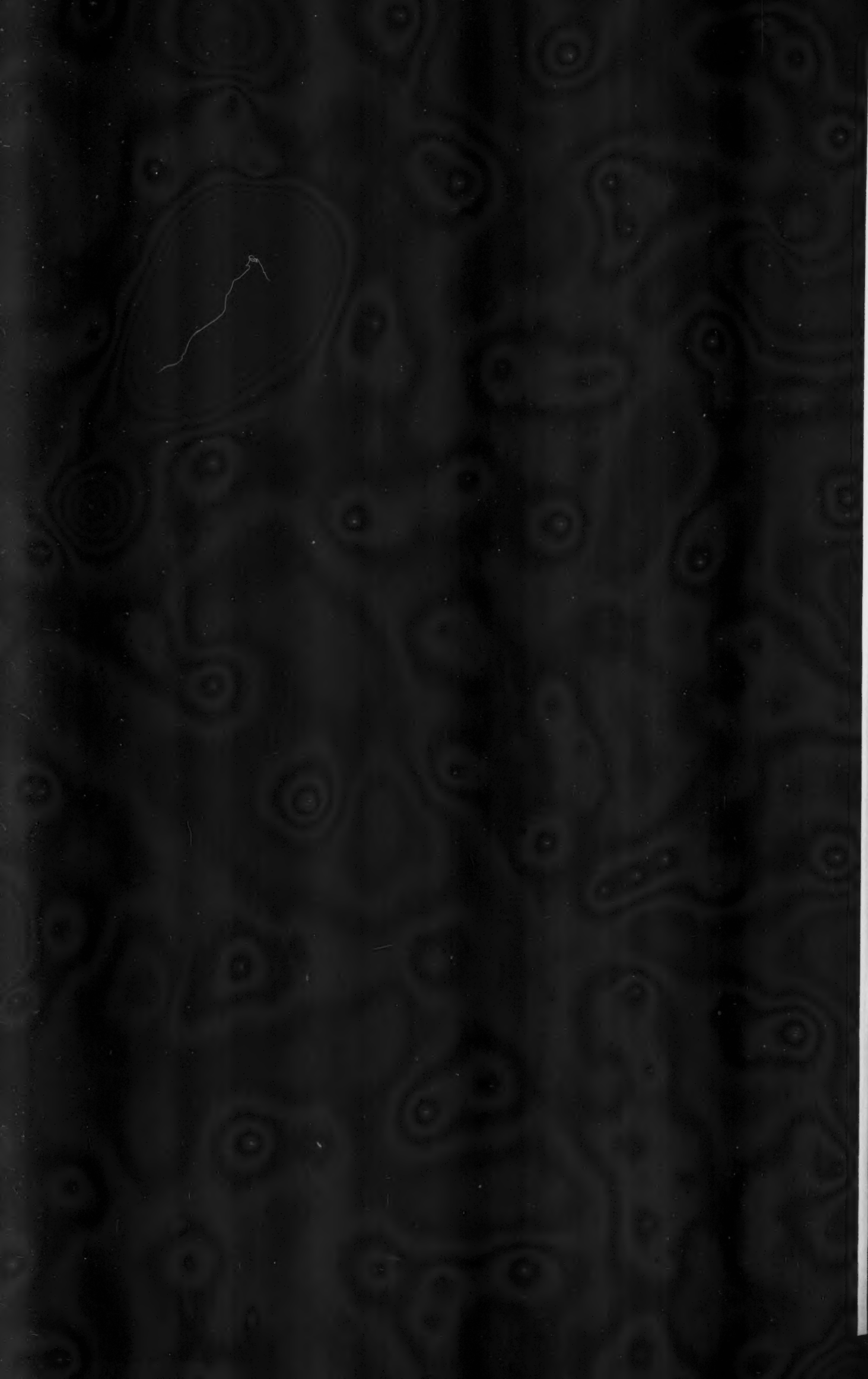


Fig. 5.—Tenoning Machine with 10-H.P. Westinghouse Motor Drive.



CONTRACTORS' COLUMN.

(*Concluded from page 868.*)

LINTHWAITE (YORKS.).—Houses, Smithriding, for C. H. Whiteley; Roydhouse, for Mrs. E. Baxter; Western Road, for J. Wimpenny and Co.; Radcliffe Road, for S. Avison.

LIVERPOOL.—Relief Station, Walton Village, for West Derby B.G. C. H. Lancaster, architect, Brougham Terrace, West Derby Road, Liverpool.

LONDON (ST. PANCRAS).—In our issue of May 8th, in a notice concerning Trinity Presbyterian Church, the address of J. A. Macdonald was incorrectly given. It should be 37, Bartholomew Road, N.W.

(EAST HAM, E.).—Twelve houses in Marlowe Road. J. Young, builder, 95, Major Road, New Town, Stratford.

(EAST HAM, E.).—Forty-seven houses in Blenheim Road. W. G. Watson, builder, 2, Milton Avenue, East Ham.

(EAST HAM, E.).—Store adjoining factory, High Street, North. Searle & Searle, architects, Paternoster House, E.C.

(POPLAR, E.).—Additions to London Small Arms Factory, Gunmakers' Lane. Todd & Newman, builders, 1A, Stannard Road, N.E.

(STEPNEY).—Warehouse, 40, Artillery Lane. W. A. Lewis, architect, 11-12, Finsbury Square, E.C.

(ISLINGTON, N.).—Renovation of the Union Congregational Chapel (£1,000), and alteration of the Sunday Schools. Rev. W. H. Harwood, pastor.

(HAMPSTEAD, N.W.).—Central Library at corner of Finchley and Arkwright Roads. A. S. Tayler, architect, 27, Old Queen Street, Westminster, S.W.

(LEWISHAM, S.E.)—Conversion of "Granville Arms," Myron Place, Lee Bridge, into business premises for Messrs. G. Stroud drapers, &c.

(TOTTENHAM, N.).—Block of flats. G. L. Wilson, builder, 552, High Road, Tottenham.

(SOUTHGATE, N.).—Twelve houses in the Mall. New London and County Building and Estates Co., Ltd.

(TOTTENHAM, N.).—Eight houses, Wargrave Avenue. E. Evans, 253, Lavender Hill, S.W., agent.

(TOTTENHAM, N.)—Six houses, Shelbourne Road. Warran & Stupart, architects, 262, West Green Road, N.

(TOTTENHAM, N.).—Twelve houses. J. H. Jolly, 12, Cadogan Terrace, South Hackney.

(CROUCH END, N.).—160 houses on Rookfield Estate. W. J. Collins and Son.

(MUSWELL HILL, N.).—Five houses. James Muddock, West Green, N.

(HIGHGATE, N.W.).—120 artisans' dwellings. Improved Industrial Dwellings Co., 33, Finsbury Square, E.C.

(EDGWARE ROAD, W.).—Conversion of premises, No. 388, for branch of London and South Western Bank, 170, Fenchurch Street, E.C.

(GREAT MARLBOROUGH STREET, W.).—Showrooms, offices, &c. Property Department, Waring & Co., 181A, Oxford Street, W.

(POLAND STREET, W.).—Shop, &c. H. A. Cunis, builder, Holland Street, Southwark, S.E.)

(REGENT STREET, W.).—Adaptation of premises, No. 159, for extension by Edwards & Sons, 161, Regent Street, stationers and engravers.

(BOW ROAD, E.).—Alterations, &c., to Palace Theatre. B. Crewe, architect, Savoy Mansions, W.C.

(CAMBRIDGE CIRCUS, W.C.).—Alterations to Palace Theatre. J. E. Walker, architect, 84, Devonport Road, Shepherd's Bush, W.

(STREATHAM, S.W.).—Five houses, Clairview Road. Crunden & Co., builders, Thrale Road, Streatham, S.W.

(STREATHAM, S.W.).—Fifteen houses. F. T. Wooding & Son, builders, Harborough Road, Streatham.

(BALHAM, S.W.).—Additions to St. Peter's Church. W. Wallis, builder, 207, High Road, Balham.

(PLUMSTEAD).—Club premises in Plumstead Road. J. O. Cock, architect, 1A, Eleanor Road, Woolwich.

(SOUTHFIELD, S.W.).—Additions, &c., to Albion Lamp Factory. E. P. Bulled & Co., builders, 8, Cromwell Road, Croydon.

(PUTNEY, S.W.).—Twenty-four houses. E. Evans, 253, Lavender Hill, S.W., agent.

(SOUTHFIELD, S.W.).—Iron building at wharf. Croggon & Co., 16, Upper Thames Street, E.C.

(BALHAM, S.W.).—Development of new roads from Upper Tooting Road to Glenburnie Road. W. C. Poole, architect, 62, Belleville Road, Wandsworth Common.

(PUTNEY, S.W.).—Development of new road. J. C. Radford, architect, 223, Upper Richmond Road, Putney.

(EUSTON ROAD, N.W.).—Buildings on site Nos. 45-113. W. C. Jones, architect, 7, Durham Place, Chelsea, S.W.

(LEWISHAM, S.E.).—Buildings in High Street. H. T. Bonner, architects, 13 and 14, King Street, Cheapside, E.C.

(KENNINGTON PARK ROAD, S.E.).—Shops. E. H. Payne, architect, 11, John Street, Bedford Row, W.C.

(CITY).—Court and offices for Corporation (£12,865). Howell J. Williams, Ltd., builders, 11-17, Bermondsey Street, S.E.

(ROTHERHITHE, E.).—Building. E. J. Bennett, architect, 10, Gray's Inn Square, W.C.

(HOXTON).—Buildings, Poole Street and New North Road. Ridge and Waymouth, architects, 104, High Holborn, W.C.

(HOLBORN).—Building. J. Slater, architect, 46, Berners Street, W.

(BETHNAL GREEN, N.E.).—Buildings in Minerva Street, Cambridge Circus, and Centre Street. Peabody Donation Fund, 64, Queen Street, Cannon Street, E.C.

(LEWISHAM, S.E.).—Development of street. A. W. Osborn, architect, 3, Railway Approach, Lewisham, S.E.

(ISLINGTON, N.).—Alterations, &c., to premises of Liptons, Ltd., 3 and 5, High Street.

(LEWISHAM, S.E.).—Buildings, Manor Lane. G. A. Lansdown, architect, 9, Regent Street, W.

(LEWISHAM, S.E.).—Fourteen houses in Bankwell Road. Hatch and Hatch, agents, Catford Hill, Catford, S.E.

(LEWISHAM, S.E.).—Ten houses in Caterham Road. H. & G. Taylor, builders, Boyne Road, Lewisham, S.E.

(LEWISHAM, S.E.).—Seven houses, Catford Hill. Norfolk & Prior, architects, Catford, S.E.

MAESTEG (BRIDGEND).—New colliery for North's Navigation Colliery Co.

MANCHESTER.—Proposed new premises at Cheadle Hulme, for Henshaw's Blind Asylum; new Catholic Schools at Moss Side (£6,000), Rev. Father Rowan, Church of English Martyrs.

(GORTON).—Rectory in connection with St. George's Church (£1,500). Rev. J. R. Yates, rector, St. George's, Gorton.

MANSFIELD.—Houses, Chesterfield Road, for Lucas Bros.; Bould Street, for Wm. Hill; Bould Street, for J. James; Moor Street, for J. W. Blood; Bagshaw Street, for Ely & Sutton; Layton Avenue, for H. Blythe; Cavendish Street, for J. R. Lawson; Victoria Street, for S. Litchfield; Charles Street, for Cartledge & Parr.

MANSFIELD WOODHOUSE (NOTTS.).—Houses, Forest Town, for A. F. Houfton; Booth Street, for Fred Walker; drill hall, Forest Town, for the Bolsover Colliery Co.

MARGAM (PORT TALBOT).—Houses, James Street, for T. Williams; Neath Road, Bryn, for Jas. Vaughan; business premises for W. H. Smith & Sons; laboratory at the County School.

MARGATE.—Houses, Glencoe Road, for J. R. Birch; Surrey Road, for A. Miles, jun.

MARPLE.—Houses off Strines Road, for Mr. Thorpe; High Lane, for Mr. Powell.

MARSDEN (YORKS.).—New premises for the Conservative Club.

MITCHAM.—St. Barnabas Church Hall (£2,900). H. Burke Downing, architect, 12, Little College Street, Westminster; G. P. & H. Barnes, builders, Streatham, S.W.

NEATH.—New premises for the Metropolitan Bank, Ltd., Swansea.

NEILSTON (RENFREWSHIRE).—Eighteen houses at Brig o' Lea for R. F. & J. Alexander, thread spinners.

NESTON (CHESHIRE).—Houses, Olive Road, for Mr. Whitney; Parkgate Road, for Evans & Wright.

NEWPORT (MON.).—Sixteen shower baths for the T.C. (£2,000).

NORBURY.—Church of St. Stephen. Rev. A. G. Edwards, Vicar.

NORTHAMPTON.—New premises for Arnold & Sansum, Ltd.

NOTTINGHAM.—Canon Lewis Memorial Hall in Coppice Road (£1,700). W. R. Gleave, Myrtledene, Bridgford Road, Nottingham, and A. R. Calvert, joint architects.

OLDHAM.—Detached residence at Shaw for A. Wild, 58, Rochdale Road, Shaw.

PAISLEY.—Further extensions to premises at corner of Cornwall and Vermont Roads, Plantation, for J. and P. Coats, Ltd. (£30,000).

PENYCRAIG.—Semi-detached villas at Pimmer. R. S. Griffiths, architect, Tonypandy.

PENZANCE.—Proposed pavilion at the Alexandra Grounds for the T.C. (£2,500).

PETERBOROUGH.—Secondary school at Fletton for the Hunts. Education Committee (£3,600).

PLYMOUTH.—Houses, W. P. G. Hill, builder, Welbeck Avenue; covered racquet court, B. H. Whiteford, Secretary, Courtney Street; villas, W. J. Dalton, builder, 2, Priory Road, Lower Compton; new hippodrome, B. Crewe, architect, Savoy Mansions, London.

REIGATE.—Parish Hall (£1,100). C. E. Salmon, architect, Bell Street, Reigate.

RICHMOND-ON-THAMES.—House and shop, Kew Road, for W. J. Ruddle; additions to 1 and 2, Eton Terrace. Brewer, Smith & Brewer, architects.

ROCHDALE.—New hippodrome (to seat 3,500) for Jackson & White, Newgate, Rochdale; branch police station for the T.C., S. S. Platt, borough surveyor; new premises, St. Chad's Fold, J. Blomley, builder, Rochdale; proposed music hall in place of the Circus of Varieties (seat 2,500).

ROCHESTER.—Houses, Belle Vue Road, St. Margaret, for F. J. Leonard; Cliffe Road, George Baker, builder, 119, Cliffe Road, Strood.

ROMFORD.—Proposed conversion of the Cock and Bell Inn into church and mission hall. Vicar of Romford.

ROTHERHAM.—Houses, Bramwell Street, for H. James; Gerard Road, for G. W. Rodgers; Clough Road, for E. J. Twigg; Ewers Road, for S. Bentham; Sheffield Road and Radcliffe Street, for Mr. Oliver; business premises, Midland Road and Devonshire Street, for Mrs. M. Sibrey.

Important additions to Alma Road Schools. J. Platts, architect, High Street, Rotherham.

ROTHESAY.—Pavilion on the Esplanade for the T.C. (£7,700).

BOWLEY REGIS.—Public Libraries for the U.D.C. D. Wright, clerk to the Council, Council Offices, Old Hill, Staffs.

RUGBY.—Proposed soap works in Lower Hillmorton Road.

RUGELEY.—B.C. Elementary school. H. T. Sandy, architect, 22, Greengate, Stafford.

SALCOMBE (DEVON).—Motor garages at the Marine Hotel and Rosemount stables.

SALFORD.—Church in Liverpool Street, Seedley (£6,500).

ST. ALBANS.—Houses, Clarence Road, for J. Elwood; London Road, for W. Hyland; bungalow, Bricket Wood, for R. B. Spanswick; additions to garden house at Wheathampstead, for the Earl of Cavan; dairy, &c., Colney Street, for Col. Cartwright.

Alterations at the White Hart Hotel and Great Red Lion Hotel.

New printing works at Fleetville for a Bolton firm.

SCARBOROUGH.—Public Hall for R. Webb. J. Getch, architect.

SEDBERGH (YORKS).—House and shops, Main Street, for T. C. Askew.

SHEERNESS.—Houses (16) Alexandra Road. W. N. Rule, The Broadway, Sheerness.

SHEFFIELD.—Residence at High Green for B. Kilner. H. Smith, architect, Wentworth, Rotherham.

Proposed new Church for St. Oswald's Parish, Millhouses.

Iron church in connection with Fitzmaurice Road Wesleyan Church.

SHILDON (CO. DURHAM).—Electric power installation at the North-Eastern Railway Co.'s Works.

SITTINGBOURNE.—Further extensions at the paper mills of Edward Lloyd, Ltd.

SKELMANTHORPE (YORKS).—Houses, Haighfield Road, for J. Biltcliffe; Highfield Road, for W. Haigh.

SOUTHAMPTON.—Sailors' Home in Oxford Street. W. H. Mitchell, Son and Gutteridge, architects, 9, Portland Street, Southampton.

STAFFORD.—Five houses in Lichfield Road for Miss A. Houlding.

STALYBRIDGE.—Infants' School for St. Paul's Staley, and Higher Elementary and Technical School in Waterloo Road.

STAMFORD.—Villa residences, Barnack Road, Stamford. Messrs. J. B. Corby and Sons, architects, 15, All Saints' Place, Stamford.

STEVENTON (BERKS.).—Proposed parish room at West Hendred.

STOCKPORT.—Proposed new Church at Bank End, near Furness Vale. Rev. Hamilton King.

STOKE-ON-TRENT (BASFORD).—New church. Austin & Paley, architects; Lancaster.

Proposed Central Wesleyan Methodist Mission Hall (£10,000).

STOWMARKET.—Additions to Council Schools (£800). A. Taylor, builder, Stowmarket.

SWADLINCOTE.—Shops, Midland Road, for T. Sabine; houses, North Street, for J. P. Winson; Sunnyside, for Dr. Gulliver.

SWANAGE.—Additions to Linden Hall, O. R. Bean; 5 detached villas in Linden Road, G. Pond.

SWANSEA.—Important additions to Oystermouth Road Schools. Margrave and Peacock, architects, Metal Exchange, Swansea.

Proposed E.L. installation at Ebenezer Church; two power stations for the T.C. to supply the new King's Dock (£25,000 to £30,000).

SWANSEA.—Houses, Glais, for Wm. Shepherd; Gorseinon, for W. J. Auckland; Gendros, for John Rees; Gorseinon, for Chas. Williams; Ynistawe, for J. G. Morgan; Gorseinon, for D. Jones; Upper Loughor, for Ben Williams; Gorseinon, for Wm. Davies; Llansamlet, for B. Llewellyn; Loughor, for David Law; Gorseinon, for J. Griffiths and D. W. Davies; Waunarlwydd, for Walter Thomas and B. G. Clark; Pontardulais, for Wm. Jones; Gorseinon, for David Thomas; Glais, for D. Harding; Llansamlet, for M. Phillips.

SWINDON.—Houses, Kingshill Road, A. J. Colborne, builder; shops, Milford Street, for A. E. Tunley; houses, The Mall, E. H. Bradley, builder, 37, Goddard Avenue.

TAYPORT.—Additions to Scott & Fyfe's factory.

TENDRING (ESSEX).—Bungalows at Little Holland for R. J. Sinfield.

TREHARRIS (GLAM.).—Twenty-six houses on the Plymouth Estate, Edwardsville, Quakers' Yard, for the Nantddu Building Co., Ltd. J. Ll. Smith, architect, Aberdare.

VALE OF CONWAY.—Proposed garden city (about 500 detached houses, installed with E.L.), between Trefriw and Talybont, to be carried out by the Dolgarog Aluminium Corporation, Ltd.

WAKEFIELD.—Wesleyan Church and Sunday Schools at Westgate End. Garside & Pennington, architects, Pontefract and Castleford.

WATERLOO (near LIVERPOOL).—Houses, Oxford Drive, for Smith & Davis; 35 artisans' dwellings, Seaforth, for the Great Central Railway Co.

WEALDSTONE.—Five houses, Newton Road. S. G. Pailthorpe, architect, 43, Finsbury Square, E.C.

WEMBLEY.—Proposed adaptation of Wembley House for public offices, &c. C. R. W. Chapman, surveyor to the U.D.C.

WHITBY.—House at Loftus for H. Hoggett.

WHITSTABLE.—Houses, Church Road, for W. London; Saddleton Road, for F. S. Gann; Joy Lane, for G. Coulter; Cromwell Road, for Mr. Allen; Canterbury Road, for Miss Rowland.

WIDNES.—Houses, Fairfield Road, for L. Pfister; Greenway Road, for E. Wood; additions to 150, Widnes Road, for Bradley, Ltd.; laboratory, Ditton Road, for Steinhart, Vogel & Cloud; new St. Mary's Church at West Bank (£20,000). Austin & Paley, architects, Lancaster.

WIGAN.—Additions to Green Hill House, Wigan Lane, N. S. Brown; additions to St. Peter's School in Rupert Street.

WOMBWELL (YORKS.).—Houses, High Street, for G. Hattersley; Main Street, for F. B. Ward & Son; Blythe Street, for T. Downend.

WORSLEY (LANCS.).—Houses, Lampton Road and Lumber Lane, for James Morris; Leigh Road, Boothstown, for W. Hulme; laundry, Timmins Street, for Miss Gill.

WREXHAM.—Semi-detached villas at Hope. J. E. Tate, architect, 9, High Street, Wrexham.

YARMOUTH.—House, Southtown Road. G. Waller, architect, Hall Plain, Yarmouth.

YORK.—Wesleyan Church at Clifton (£8,000). E. Taylor, architect, Stonegate, York.

FORTHCOMING EVENTS.

To-day's Events (Friday, May 22nd).—At 4.30 p.m. At the Royal College of Science, South Kensington. Physical Society. Special general meeting, followed by an ordinary meeting. Papers on "The Spectrum Top," by Mr. F. P. Sexton; "The Coefficient of Diffusion," by Mr. B. W. Clack; and on "The Production of Small Alternating Currents of Variable Frequency," by Mr. B. S. Cohen.

Saturday, May 23rd.—Junior Institution of Engineers. Visit to Avonmouth Dock works and electricity works, Bristol.

Tuesday, May 26th.—At 8 p.m. At the Institution of Electrical Engineers. Faraday Society. Presidential address on "Some Aspects of the Work of Lord Kelvin," by Sir Oliver Lodge, F.R.S.

Wednesday, May 27th.—Annual general meeting of Electric Supply Football League.

Thursday, May 28th.—At 12.30 p.m. Institution of Electrical Engineers. Annual general meeting.

Saturday, May 30th.—Liverpool and District Electrical Association. Visit to Southport.

NOTES.

A Colliery Assessment.—At a meeting of the Merthyr Union Assessment Committee on Saturday, Mr. C. Kenshole, solicitor, appealed on behalf of the Powell Duffryn Colliery Co. against an assessment of £3,155 gross and £1,894 ratable on certain surface works at their Bargoed Colliery. The assessment appealed against was on an iron foundry, coal washing plant, sulphuric acid plant, pattern shop, fitting shop and smithy, and siding in connection with part of the electric generating station and part of the gasworks. Mr. Kenshole submitted that the assessment was bad, as all these things were lumped together. As for the electric generating station, he could not conceive on what principle they were assessed in respect of that. The Committee might as well charge them for their winding engine or fan. The station was simply used to generate electricity which was used instead of steam. They were not charged for their steam engines or steam boilers, but because they put up a generating station they were charged for it. The gasworks were provided for collecting gases from the coke ovens, and storing them for the purpose of working the electric generating plant. The undertaking was in a very experimental stage, and did not bring in more than £100 a year altogether. After hearing Mr. Kenshole, the Committee offered to reduce the ratable value to £1,660, but Mr. Kenshole declined to accept these terms, and so there would be an appeal to Quarter Sessions.

London Electrical Engineers.—The London Electrical Engineers, whose name has recently been before the public in connection with the formation of the London Balloon Company, are now devoting their energies to raising the Telegraph Companies allotted to them under the Territorial scheme. A nucleus of N.C.O.'s and men is transferring from the present Corps to the new Field units, but there are vacancies for a good number of outside men—wireless experts, linemen, wiremen, telegraph operators, experienced drivers and intelligent and willing men who are prepared to devote the necessary time to learning the special duties of the Corps. There will also be room for a few special men—students from technical colleges, polytechnics and similar institutions, practical engineers, &c.—to complete the Electrical Engineers' Coast Defences Companies. The qualifications for joining and the terms of enlistment are as follows:—

Period of enlistment	4 years.
Age limits	17 to 35 years.
Height, drivers	5 ft. 3 in. to 5 ft. 6 in.
„ sappers	5 ft. 4 in. and upwards.
Chest measurement	33 in. minimum.

The men will go to Camp for a training of 8 days (or 15 days optional) in the summer, and will receive regimental and engineer pay at army rates for this period. Recruiting is very brisk at present, and men wishing to join any of these units should apply personally, on Tuesdays at 7 p.m., or by letter to—

The Officer Commanding,
London Division, Electrical Engineers,
Regency Street,
Westminster, S.W.

Ex-military men of the R.E. R.A. and A.S.C. branches of the Service and ex-Volunteers with practical experience of driving—and a few men with practical training in military cooking—will receive special consideration.

The Proposed Institute of Metals.—In regard to the movement which originated in Manchester for the formation of a Copper and Brass Institute, we understand that a further meeting is to be held at the Institution of Mechanical Engineers, Storey's Gate, London, on June 10th, at 2.30 p.m., to consider the proposal to establish an "Institute of Metals." All interested in the manufacture or use of brass, copper, lead, zinc, aluminium, nickel, gold, silver—in fact, in the non-ferrous metals, and their alloys—are earnestly invited to attend. Mr. W. H. Johnson informs us in a circular that he is assured of the approval and co-operation in the formation of the Institute of various trades, including electric cable makers and electrical manufacturers.

Recent Extension of the Manchester Electrical Department.—In connection with our article on the above last week, we are informed that the centrifugal circulating plant installed is of the De Laval type, supplied by Messrs. Greenwood and Batley, and not the Worthington pattern, as we had been given to understand. Messrs. Bray, Markham & Reiss also inform us that they supplied all the starting switches for the motor-converters in the Dickinson Street and other sub-stations, and the shunt regulators for the 1,500-KW. motor-converters.

Institution and Lecture Notes.—ASSOCIATION OF TEACHERS IN TECHNICAL INSTITUTIONS.—The second annual conference of this Association will be held in London at Whitsuntide, June 6th to 10th. On Saturday, June 6th, there will be a meeting of delegates at St. Bride's Institute, Fleet Street, E.C., and in the evening a conversazione. On Monday an address will be delivered by the President, Mr. Chas. Harrap, at Anderton's Hotel, Fleet Street, E.C., and papers will be read on "Group Courses and Continuation Schools," by Messrs. W. J. Lineham and R. W. Fergusson; and "Homework and Tutorial Classes," by Messrs. Barker North and A. Adamson. The Building Section and the Arts and Crafts Section will meet in the evening, and papers will be read on "Commercialism, The Schools, and The Decorative Arts," by Mr. Lewis F. Day; and "Modern Education—The Technical Phase," by Mr. S. Hicks. On Tuesday there will be a discussion on professional matters, and a Paper on "Trade and Technical Schools," by Messrs. Millis and P. A. Wells. The annual dinner of the Association will take place in the evening at Anderton's Hotel. On Wednesday an excursion to Windsor and Hampton Court will complete the programme. All interested in technical education are invited to attend the meetings and discussions.

National Telephone Co.'s Dinner.—On Thursday last week the 14th annual dinner of the National Telephone Co., Ltd., took place at the Trocadero; Mr. Albert Anns, secretary, occupied the chair, and there was the usual large attendance of officers of the company, representing the staff (which numbers over 18,000) and of guests, amongst the latter being Mr. George Franklin (president), Lord Harris, Sir Frank Crisp, Sir Albert Rollit, Sir Cuthbert Quilter, Sir John Gavey, Sir J. C. Lamb, Sir Robt. Hunter, Major W. A. J. O'Meara, Mr. Frank Gill (engineer-in-chief), and Mr. S. J. Goddard (general superintendent).

After the loyal toasts had been honoured, the chairman, proposing "The National Telephone Company," paid a tribute to the memory of his predecessor in the chair, the late general manager, Mr. W. E. L. Gaine, referring to his courage, perseverance and determination, and to the great loss the company had suffered through his early decease. Two years ago, he said, the company had been in conflict with certain municipalities, which, under a misapprehension as to the cost of conducting the telephone service, had entered upon it themselves, with the result that the Government had had to come to their assistance. The introduction of the measured-rate system of charging a year ago had been met with opposition, but it was now being generally acknowledged that it was the only correct method of charging. The new Gerrard Street Exchange, which had cost over £150,000, was as perfect as

money and brains could make it; and 175 new exchanges had been opened during the year. Regarding the future of the company, the staff were concerned about their prospects in 1911, but the directors had never been unjust to the staff, and there were no grounds for uneasiness. The transfer would be a magnificent bargain for the Government, which could well afford to deal generously with the staff that had made the business a success. The Pension Fund was absolutely sound and adequate for its purpose; it would be wound up in 1911, and a handsome surplus would be distributed.

Replying to the toast, Sir George Franklin associated himself with Mr. Anns's expressions of regret for those who had been taken from them, and remarked that if they had supplied a service for 17 years on a wrong system of charging, that was no reason why they should not change it for a better; they wished to be sure of a moderate return, during the short period remaining, on the capital still to be expended. The staff were entitled to an assurance as to their future position; the greatest assets to be taken over were the energy and devotion of the staff, and he had no doubt that the Government would give that assurance in due course, while the directors would do all they could to see that no member of the staff should be placed at a disadvantage. The income and capital of the company had doubled every eight years, under adverse circumstances; what a vista of progress would open in 1912! They had one station to every ninety-six of the population, and more telephones than any Continental Power except Germany. It was 28 years since a licence was given by the Government, which had taken in return 2½ million sterling by way of royalties; not one wayleave was given. The average annual return to the shareholders had never even equalled 4¾ per cent., and even if the reserve fund were included, the total profits had never equalled 6¾ per cent.

Proposing "Our Guests," Mr. S. J. Goddard thanked the president for his assurance as to the future of the staff at the transfer, and said that the staff, which had always been loyal to the company, would be equally loyal to the Government.

Sir Albert Rollit, replying in his customary humorous vein, remarked on the application of the time-limit to the company's licence; and Major O'Meara, who was in the rival camp, said that an armistice had been concluded. The ultimate fight would not be an easy one; there would be a warfare of wits, but eventually the opponents, he hoped, would meet as colleagues.

An excellent programme of musical and other entertainment was provided during the evening.

King's College Annual Dinner.—The forty-eighth annual dinner of King's College will be held at the Hotel Cecil on Wednesday, June 3rd. Viscount Milner will take the chair.

Appointment Vacant.—Assistant electrical engineer for temporary service in the Public Works Department of Southern Nigeria. See "Official Notices" to-day.

"Electric Light in Every House."—"No more large gas bills or dangerous oil lamps. Make your own electricity; no engines or dynamos required. No experience. Simple, inexpensive and certain. Write at once, enclosing 1/1 postal order, to . . . Liverpool."

The above advertisement appears in a Sunday paper. It would be interesting to know what the advertiser has to offer for thirteen pence—and how many postal orders he has received from a credulous public.

The Franco-British Exhibition.—On Wednesday afternoon last we paid a second visit to the Machinery Hall since its opening, in order to obtain an idea as to the progress that had been made. Entering it from the French end, we found some electrical exhibits by French firms, slowly letting their outer garments of chaos and unloveliness fall, revealing the forms of electric motors, electric batteries, and some other such things—but for the most part here the principal operations in progress are those of the carpenter, the seamstress and others who take part in the erection and decoration of stands and show-cases. Sometimes here, as in other parts of the Exhibition, we had to step over part of an exhibit in order to get through, but that sort of thing one becomes used to at Shepherd's Bush in these early days. Farther on, after passing the steamship model exhibits and some others, we came upon the Parsons exhibit, and were pleased to find it looking far more like a turbo-generator than it did a week ago. Close by W. H. Allen's have an all-but complete exhibit, and so have Babcock and Wilcox. Making progress toward what we may call the Mather & Platt-Herbert end of the Hall, we passed the building that is being erected for the exhibit of the London electric supply companies. The windows were being put in, and a week should made a great difference here. We hope that the firms taking part in the arrangements are ready with their material and apparatus. The premises are close to the gas exhibit, whereon there was also more or less feverish activity. It will be an interesting race to see which can be ready first—the electrical or the gas display—we have little doubt which will be the more effective and impressive to such of the general public as find their way into the Machinery Hall.

Supply Authorities and the Franco-British Display.—St. Pancras B.C. Electricity Committee recommends that not more than £25 be contributed toward the expense of providing the Electric Supply Exhibit at the Franco-British Exhibition.

NEW COMPANIES REGISTERED.

Santoni Arc Lamp and Engineering Co., Ltd. (97,956).—This company was registered on May 13th, with a capital of £3,000 in £1 shares, to carry on the business of electrical and general engineers, contractors, manufacturers of electrical and mechanical appliances for lighting, power and traction, importers and exporters of economic, domestic, scientific, curative and pastime electrical appliances, dealers in electrical goods and accessories, and to acquire the business of the arc lamp department of D. Santoni & Co., Ltd., formerly carried on at 15-17, Beauchamp Street, Brooke Street, E.C. The subscribers (with one share each) are:—D. Santoni, 10, Coburg Place, Hyde Park, W., electrical engineer; G. A. Knapton, 95, Lansdowne Road, Old Charlton, electrical engineer; E. E. Tasker, The Chase, Chigwell Row, Essex, electrical engineer; A. Brown, 1, Colville Square, Bayswater, gentleman; L. Gros, 31, Colville Gardens, Bayswater, W., stockbroker's clerk; K. Fredler, 3, St. Stephen's Square, W., manufacturer's agent; W. McIntosh Whyte, 11, Queen Victoria Street, E.C., incorporated accountant. No initial public issue. The number of directors is not to be less than two or more than five; the first are D. Santoni (managing director for 10 years) and others to be appointed by subscribers; qualification, £1: remuneration, £25 each per annum (£50 extra for managing director).

E. A. Prevette, Ltd. (97,963).—This company was registered on May 14th, with a capital of £3,000 in £1 shares, to acquire patents and rights for inventions relating to an electrical burglar alarm and an electrical clock, to acquire the business of E. A. Prevette at 35, Grove Road, Eastbourne, and to carry on the business of electricians, electrical, telegraph, mechanical, sanitary, gas and water engineers, clock and watch makers, railway contractors, ironmongers, builders of electric tramcars, motor-cars, cycles and other vehicles, manufacturers of and dealers in dynamos, motors, telephones, bells, electroliers and arc and other lamps, &c. The subscribers (with one share each) are:—Miss A. F. White, 95, Susans Road, Eastbourne; E. A. Prevette, 95, Susans Road, Eastbourne; R. G. Hudson, 126, Terminus Road, Eastbourne, accountant; R. H. Bradford, 1, Terminus Road, Eastbourne, stock and share dealer; E. Prevette, 8, Marine Road, Eastbourne, traveller; A. J. R. Morris, 2, South Street, Eastbourne, watchmaker; D. W. A. Roberts, 5, Bedford Grove, Eastbourne, engineer. No initial public issue. Registered without articles of association. Registered office, 35, Grove Road, Eastbourne.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Tuesday last, at the Walthamstow U.D.C. electricity works, MR. E. T. HURST was presented with a kit-bag, as a farewell gift of the staff, on account of his leaving to take up a position as switchboard attendant to the Newcastle-upon-Tyne Electric Supply Co. The presentation was made by Mr. G. R. Spurr, the chief electrical engineer.

One hundred and ninety applications were received for the position of canvasser in the Fulham electricity department. The Committee has appointed MR. S. A. LOVICK (Hither Green), at present canvasser in the Stoke Newington electricity department, and who has held several similar positions under other local authorities and electric supply companies.

Pontypridd Council has resolved to advance the salary of MR. J. E. TEASDEL, the electrical engineer and manager, from £350 by two annual increments of £25 each to £400.

A South African correspondent, writing under date April 11th, says that the city electrical engineer of Cape Town (MR. WALTER F. LONG), intends leaving there shortly for a few months' holiday in England. Mr. Long has been in his present position for about five years, without paying a visit to the old country.

The staff and employés at the Swansea electricity works, have presented a fumed oak roll-top desk, to MR. G. H. THOMSON, who is leaving to become electrical engineer and manager to the Neath R.D.C.

The Ilford U.D.C. has appointed MR. A. GLAZIER, of Ilford, as third charge engineer at the electricity works.

General.—MR. ATHOL G. EVANS, who was recently with Stone and Webster Engineering Corporation and the Edison Electric Illuminating Co., Boston, U.S.A., sailed on ss. *Mauretania* from New York on May 13th to take up a position as switchboard designer and estimator with Messrs. Dick, Kerr & Co., Ltd., Preston.

The *Times* states that a marble bust of the late MR. GEORGE HERRING, the well-known benefactor of the Hospital Sunday Fund, will be unveiled at the Mansion House on Monday, June 15th.

REV. F. LAFONT, S.J., C.I.E., who has been for several years the chairman of the local branch of the I.E.E., is lying dangerously ill in the Darjeeling Sanitarium. According to an Indian correspondent, he has for upwards of 50 years in India done magnificent educational work as Physics Professor, and his frequent lectures on popular scientific subjects have always gathered large and interested audiences; he was made a Companion of the Indian Empire by the Government for his scientific attainments, and for many years past he has been looked up to as the *doyen* of science in India. His friends hope that his recovery will be speedy.

MR. SIDNEY A. M. ROSE, A.M.I.E.E., of Melbourne, Australia, is at present in London, for the purpose of demonstrating a new system which he has patented for automatically recording shots on targets instantaneously and at any speed, the records being made at the firing point.

CITY NOTES.

General Electric Co. (U.S.A.).

ACCORDING to the New York *Electrical World* the annual report of this company has just been issued, and is on the whole a most satisfactory document from whatever point of view it is regarded.

"The sales billed for the year ending January 31st were $70,977,168 as compared with $60,071,883 in 1906; and the orders were $59,301,040, as compared with $60,483,659, the slight falling off in orders being due, of course, to the financial panic of last October. During the past 10 years, the sales billed have increased annually about 19·8 per cent., and in 1907 were 18·2 per cent. over the previous year. While the orders in the last six months fell off 23 per cent, they had gained 22 per cent. during the first six months, which gives a crisp idea of the sharp industrial change. The report of President Coffin shows that the gross profits for the year were $6,586,653, after writing off $3,745,989 for factory depreciation, &c. Dividends were paid to the amount of $5,183,614, and $1,403,039 was carried to surplus account, making a total surplus at the end of the fiscal year of $16,513,836. The total receipts for the year were $72,484,988. Mr Coffin says:—'Late in the year there was a sudden and severe shrinkage in the value of all merchandise and materials used by your company—notably copper. All said materials, whether raw, manufactured or in process of manufacture, which were on hand January 31st, 1908, were inventoried at the lower prices then prevailing. The book value of such inventories was thereby reduced by about $2,000,000. In valuing the notes and accounts receivable, in amount the largest in your company's history, great care has been exercised and liberal reserves have been established to provide for possible losses thereon. These reserves, and allowances for depreciation of factory plants, and the shrinkage in inventory values have greatly reduced the profits of your company. As a result, the amount in excess of dividends upon the share capital, which is carried forward to surplus account is relatively small.'

"The various securities owned by the company after a careful revaluation are carried at $18,000,089, but this does not include $2,701,975 in copper properties. The factories are carried at a valuation of $12,900,000, or only $2 per square foot of floor space, inclusive of land and equipment. Patents are carried at $1. Cash in hand was $12,250,720 and there was $20,857,726 in notes and accounts receivable. Merchandise inventories and work in hand total up $22,273,349. On the other hand, accounts payable were only $1,759,517. The capital stock issued is $65,167,400, and there are not quite $15,000,000 of gold debentures out."

Rangoon Electric Tramway and Supply Co., Ltd.

The annual meeting was held on May 14th, at Liverpool. Mr. Frank Tobin presided, and, in reviewing the accounts, he said they had issued £50,000 in preference shares and £25,000 in ordinary shares. Outside the two large items of £40,000 for underground cables and £30,000 for the house-fitting department, the new capital raised had been expended on the enlargement of the distribution system. In the prospectus, he continued, it was estimated that the takings of the tramway would be £1,000 per week. They were, he was pleased to state, taking that amount, and as time went on he hoped they would see the traffic grow, as had been the usual experience of tramways. They aimed at getting the working expenses down to 50 per cent., and he could safely say that even if they could not achieve that this year they would come within measureable distance of it, and would, at any rate, be far removed from the 70 per cent. of last year. Referring to the other departments of the undertaking—public and private lighting—the chairman said, with regard to the former, that the whole of the lighting contracted for with the municipality of Rangoon was completed at the end of last month. As to private lighting—and by that he meant the whole of their supply service outside the municipality contract—it was evident that they had underestimated the amount of demand for this purpose. It was only now that they could really take up the private lighting in earnest. Their (the company's) complaint was not that they could not get customers, but that they were not yet in a position to supply them. Government institutions, the Burmah Railway, and many other public and private concerns were asking to be supplied, and the estimated gross revenue from contracts offered them—quite in addition to any contemplated in the prospectus—was £35,000. Their position this year was that the public lighting would be bringing in revenue for eight months, and that they would have made a start with private lighting, with, however, an almost certain prospect that in 1909 this last-named source of revenue would have attained a really satisfactory figure, and would, he hoped and believed, justify the confidence of their ordinary shareholders, and bring them the reward which their patience merited.

Mr. Jas. Taylor seconded the motion, and it was agreed to.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The half-yearly meeting was held on Wednesday, May 13th, at Electra House, Sir J. Wolfe Barry presiding.

The Chairman, in proposing the adoption of the report, said that the gross revenue for the half-year under review amounted, in round numbers, to £304,000, against £296,000 for the corresponding period of 1906, showing an increase of £8,000. This result might be considered satisfactory having regard to the general depression in trade that had recently prevailed in the Far East and elsewhere, and to the keen competition that still continued between the Government Pacific Cable and their system for the Australasian traffic. He was, however, happy to say that they continued to hold their own in this competition, notwithstanding the strong pressure brought to bear upon the commercial community by the local authorities to forward their telegrams by the Pacific route, and the fact that nearly all Government telegrams were sent by the latter route. He could not but think that this was very unfair to them, and that as a great British company they were entitled to an equal share of Government business. The working expenses amounted, in round numbers, to £154,000, against £139,000, showing an increase of £15,000. Of this increase, over £13,000 was due to cable repairs having been far more numerous during the past half-year than in 1906, when they were exceptionally light, costing only £12,854, or about one-half of the normal amount. The rest of the increase was accounted for by the natural growth of salaries and wages. They had had to spend over £1,000 in connection with a claim made upon the company by the owners of the ss. *Agincourt* for consequential damages arising out of the loss of that steamer's anchors and chain when she fouled one of the company's cables in the Yang-tsze-kiang River. The claim being a very wide one, involving far-reaching consequences, the directors had no alternative but to resist it, especially as it had always been understood that the International Convention for the Protection of Submarine Cables, limited the company's liability to making compensation to the value of the material actually lost. Unfortunately this view was not accepted by the Court of First Instance, which held that although the claim of the plaintiffs went too far, the owners of the *Agincourt* were entitled to a larger measure of compensation than that admitted by the company. Thereupon the directors appealed against Mr. Justice Bray's decision, and obtained a unanimous decision from the Lords Justices of Appeal altering the learned judge's order, and declaring that the liability of the company was to make compensation for the sacrifice of the anchors and chain lost, but not further to pay damages resulting from such sacrifice. The action was eventually settled on this basis. It is needless to say that any other result might have been most damaging to the interests of all those who had laid and were working telegraphic cables. The net profit for the half-year amounted, in round numbers, to £130,000, and after adding £75,000 brought forward from the previous half-year, there remained an available balance of £205,000. The usual quarterly interim dividends of 2s. 6d. per share were paid during the past year, and it was now proposed to distribute a final dividend for the year of like amount, making a total dividend of 5 per cent. It was also proposed to pay a bonus of 4s. per share, or 2 per cent., making a total distribution for the year 1907 of 7 per cent. The usual additions had been made during the year to the maintenance ships' insurance and depreciation funds, and after applying £54,000 of the revenue balance to the general reserve fund, the sum of £20,389 was carried forward. During the past half-year several partial renewals of the company's cables had been carried out. The lengths of new cable inserted for these purposes had aggregated 330 nautical miles, and the cost of such renewals, amounting to £28,848, had been debited to the general reserve fund. The laying of the company's new direct cable between Java and the Cocos Islands, to which he had made reference at previous meetings, had been successfully accomplished, and the line opened for traffic since the close of the year. The length of the cable was roundly 778 nautical miles, and the cost would be charged against the general reserve fund during the current half-year. This new communication would form a useful alternative route for their Far East traffic, and had it been in operation when the recent strike occurred amongst the Indian Government telegraph employés, it would have assisted in relieving the congestion occasioned during the early days of the strike. The Indian Government authorities shortly after the outbreak, fortunately for the cable communications passing in transit through India, arranged with the Eastern and Eastern Extension Companies to work two of their landlines from the cable stations at Bombay and Madras, and in this manner they were able to transmit the trans-Indian traffic across India with satisfactory results to the telegraphing public and to the Indian Government. When the strike was over the landlines were again worked by the Government, but they were in communication with the Indian authorities with a view to obtaining, if satisfactory terms could be arranged, the permanent working across India of the trans-Indian traffic by the Eastern and Eastern Extension Companies, as they were convinced that such an arrangement would be to the advantage in speed and accuracy of all the countries which they served. Another quinquennial meeting of the International Telegraph Conference was now being held at Lisbon, and two of their directors were attending it to look after the company's interests. Judging from what appeared in the newspapers a few weeks ago, considerable misapprehension appeared to have existed on the part of the Chambers of Commerce and telegraphing public generally as to the action of the Governments and cable companies at the Conference in regard to the use of artificial words in code telegrams; but the publication of the Postmaster-General's letter to the Chambers of Commerce on the subject would have made it clear that it was not proposed to withdraw the privilege, but only to endeavour to have more clearly defined the condition as to the "pronounceability" of artificial words. When the concession of admitting "pronounceable" artificial words on the footing of code at ten letters to the word was granted, it was assumed that the privilege of making up codes on this basis would be used in a resonable manner, so that the telegraph service, whether by cable or landline, might not unduly suffer, while the public would be benefited. This expectation has not been completely fulfilled. Before the new regulations came into force the British Post Office found it necessary to issue a circular to the Chambers of Commerce, as well as to the principal code makers, directing attention to the fact that codes were being compiled of artificial groups which, in many cases, could not be

regarded as "pronounceable," and that such words would be difficult to transmit, and would lead to errors. In many cases code makers had recognised the importance of avoiding combinations which were of doubtful pronounceability, but in some cases an unreasonable use of the concession had been shown. As an instance of this, such words as "bujkarocty," "bywrgrocbx" and "liqraqkper" might be mentioned as words which appeared in a code recently submitted. It would be readily understood that a telegraphist could deal more rapidly and easily with a pronounceable word, which could be more quickly grasped and remembered while it was being transmitted, as compared with an arbitrary combination of letters requiring a separate effort of attention for each letter. Thus greater speed and accuracy, which were what the public required, were obtained, and there was less need for repetitions and corrections. It was desirable and to be hoped that the condition as to pronounceability would at the Conference be more clearly defined, in order to put some limit for the future to the growing tendency, which, if unchecked, could not fail to produce results highly injurious to the telegraph service and consequently to the public and commerce. There was, however, no intention of adopting other than a wide and even generous interpretation which would cover the great bulk of the codes at present in use. Speaking generally of the report, he thought they might consider it as fairly satisfactory, though he wished that he could see greater signs of commercial development in the Far East, and fairer treatment of their company by the Governments concerned in the State-aided competitive cable in the Pacific.

The Marquis of Tweeddale seconded the motion, and the report was adopted.

Deutsch-Niederlandische Telegraphen Gesellschaft Co.

The German Netherlands Telegraph Co., of Cologne, which receives a joint subsidy of £95,000 per annum from the German and Dutch Governments, declared a dividend at the recent general meeting at the rate of 6½ per cent. for 1907, as compared with 6 per cent. in the preceding year. It will be recollected that the company has cables in operation in the Far East between Menado and Guam, and an extension to Shanghai, with a connection with the United States *viâ* the American Pacific cable between Guam and San Francisco. The report presented at the meeting stated that no interruptions in the cables took place during the year, and that the working at all times proceeded smoothly. The financial figures for the past two years are as follows:—

	1907.	1906.
Share capital	£350,000	£350,000
Loans	350,350	362,500
Receipts	101,453	101,020
Working expenses...	18,208	17,328
Cable maintenance provision ...	10,231	10,321
Renewal fund provision	8,750	8,750
Cable maintenance reserve ...	4,675	4,553
Depreciation provision	2,318	2,115
Net surplus...	40,648	34,103
Dividend, per cent.	6½	6

The accounts also show an allocation of £1,634 to the legal reserve fund, £1,000 to the pension fund, £2,500 for the future provision of duplex apparatus, and £3,500 to a special reserve fund.

Lisbon Electric Tramways Co.

Sir Charles Euan Smith presided on May 13th over the annual meeting held at London Wall Buildings, E.C. In moving the adoption of the report (see Electrical Review, May 15th, p. 835), the Chairman, after referring with deep regret to the death of the late King of Portugal, said that the operation of the tramways had practically maintained the figures of the previous year, in spite of several disadvantageous factors. The rate of exchange, owing to political and other causes, had considerably declined. The year 1907 in Portugal resulted in abnormal weather, and consequently there was a poor harvest. They had added substantially to the rolling stock, having 25 cars over and above those in operation last year, also they had added to the equipment of their cables. The additions to capital expenditure during the year amounted to £72,271. That was accounted for by the large additions to the rolling stock, the equipment of cables and the installation of the electric light at Elevardor. The board were utilising the reserve fund for making the necessary expenditure, so that they would not have to increase the share capital. Although during the past three months Lisbon had been passing through a political crisis, he was glad to congratulate the shareholders on the fact that the prosperity of the undertaking had been little affected. They had lost a certain amount of traffic, but on the whole, the system had maintained its service successfully and with little derangement during the worst period of the political unrest. The outlook had, however, improved, and he was sure the shareholders would endorse the prudent policy of the board in husbanding the resources of the company and maintaining a strong financial position. Referring to a circular issued by Mr. Alfred Parrish, a former director of the company, the chairman said that the directors could not for one moment entertain the rash and unbusinesslike policy advocated by that gentleman. He would point out that, under the present board's administration during the last seven years, they had converted a working loss of £14,000 into a yearly profit of about £120,000. The directors therefore appealed with confidence to the shareholders to support the policy which the directors had pursued of placing and maintaining the company on a thoroughly sound and safe basis, so firmly laid as to be able to cope with unforeseen demands. The present situation in Lisbon was still uncertain, and therefore they would see the need of reserve and caution. The board entirely dissented from the damaging tenor of the remarks made by Mr. Parrish as regarded the treatment that the company had received at the hands of the Portuguese Government and Municipality.

Mr. J. B. Taylor seconded the motion, and the report was adopted.

Mr. L. Breitmeyer, referring to Mr. Parrish's circular, said it was not true, as stated by that gentleman, that Messrs. Burnay and Co., and his firm, Messrs. Wernher, Beit & Co., had gradually reduced their holding, and thus practically lost control of the company. He might say that Messrs. Burnay & Co. held about 74,000 shares, and his firm over 180,000 shares, and if he included the holdings of their former partners—the late Mr. Alfred Beit and Mr. Michaelis—that holding would be about double. There were also 425,000 preference shares in the company, which enjoyed equal voting right with the ordinary stock. He made that statement to show their friends in Lisbon that the original promoters of the company still had full confidence in the concern.

Auckland Electric Tramways Co., Ltd.

The directors' report for 1907 shows that the total revenue was £140,452, as compared with £132,365 for 1906. The traffic receipts were £137,718, an increase of £7,381. After deducting all expenses chargeable to revenue, including £14,255 for interest on debenture stock, and providing for the rental and percentage of profits payable to the Auckland City Council amounting to £3 568, and setting aside £10,000 to meet depreciation, there remains a surplus of £29,722. The expenses include expenditure on repairs and maintenance, amounting to £20,351, as compared with £16,915 during 1906. In addition, £18,726 has been expended on renewals and charged to depreciation account. A large portion of the latter amount was in connection with the reconstruction of the track in Queen Street, which has now been completed. The available balance is £32,824. There is placed to reserve fund £10,000; 6 per cent. on preference shares, requires £2,658; dividend (6 per cent. per annum) on ordinary shares, £18,000; balance carried forward, £2,165. Nearly the whole of the new preference shares were taken up in Auckland. The capital expenditure during the year was £71,398, making the total expenditure on the tramways £664,391, but only to a very slight extent did the increased expenditure become remunerative during the year. The directors therefore consider it prudent to reduce the dividend on the ordinary shares by 1 per cent., representing £3,000. The year's expenditure included the cost of material for the Mount Eden, Mount Roskill and Grey Lynn extensions, which are now constructing, the cost of a new generating set of 600 kw. capacity and two new boilers, which have been installed, and the purchase of large additions to the rolling stock. The total number of cars is now 87. The company has joined the British Electrical Federation. Lieut.-Col. Henry Burton who has lately left Auckland to reside in this country, and who holds a considerable interest in the company, is recommended to a seat on the board and the number of directors is to be increased to four.

	Year ended Dec. 31st, 1906.	Year ended Dec. 31st, 1907.
Miles open—Route miles	12·2	12·2
Single line..	6·99	6·99
Double line	12·21	12·21
Passengers carried	21,104,651	22,474,587
Average receipts per passenger	1·48d.	1·47d.
Average expenditure per passenger	0·81d.	0·83d.
Proportion of expenses to receipts	55 per cent.	60 per cent.
Number of cars in working	60	71

Edmundson's Electricity Corporation.

An adjourned meeting of the debenture-holders was held on May 14th to further consider the question of the issue of prior lien bonds, Mr. Hubert Ansell presiding.

Mr. Tuckett reminded the meeting that the previous one was adjourned in order to give the board an opportunity of conferring with the debenture-holders, who failed to share the views which they held in regard to the raising of additional capital. They had met those gentlemen, and he was glad to say they had been able to dispel most, if not all, of the misunderstandings which existed at the last meeting, and he believed they had arrived at an understanding which he hoped would be acceptable to the debenture-holders. He would not repeat the arguments he put before them on the last occasion as to why additional capital was required, and why prior lien stock was the only way in which it could be raised on satisfactory terms. It was generally conceded by the debenture-holders that additional capital was essential, and the prior lien bonds were the only possible way of raising it—the only question in doubt was the terms on which they ought to be prepared to agree to the issue. In making their original proposal they considered they were doing everything which the debenture-holders were entitled to call upon them to do with a view to safeguarding their interests, and he could assure them that the trustees went out of their way to insert provisions in the deed which would ensure prudent administration of the company, and which would ensure that their security should not be jeopardised by any improper dealing with the

profits. The principal features of the supplementary trust deed were, that in addition to the 1 per cent. sinking fund on the prior lien stock commencing in July, 1912, they should have a 1 per cent. cumulative sinking fund on the stock commencing at the same time, and in addition a further ½ per cent. sinking fund contingent on the profits of each year. In addition to that, all the profits down to March 31st, 1911, were to be set aside either for the redemption of stock or a reserve fund, but in no case were they to be available for distribution as dividend. There were various other provisions in the deed calculated to enhance their security. At the last meeting, Mr. Bingham, one of the debenture-holders, made an extremely weighty and forcible speech from a rather different standpoint to that which they had adopted. He recognised that in what they were doing they were trying to safeguard the interests of the debenture-holders, but he felt very strongly that the debenture-holders in agreeing to accept the position of second mortgages, and in allowing a prior lien charge to be put ahead of them, were entitled to claim something more than the mere security which they were willing to concede. Mr. Bingham felt that inasmuch as the debenture-holders were being asked to improve the position, not only in their own interests, but ultimately in the interest of the shareholders, the shareholders should be asked to make some definite concession to them since the debenture-holders were the people, who, in the first place, were taking the risk of the new money producing the results which they anticipated from it. Although as the guardian of the shareholders' interests, he did not wish to give away anything which he could avoid giving away, he must admit that he did feel the force of the arguments which Mr. Bingham had put forward, and he had done what he could to meet them. Mr. Bingham suggested, as the minimum which he and those acting with him were prepared to accept, that in place of the extra ½ per cent. sinking fund commencing in 1912 contingent on profits, the board should concede ½ per cent. additional interest, making the existing 4½ per cent. stock a 5 per cent. one. That additional ½ per cent. interest should only attach to the stock so long as there was any prior lien stock outstanding, so that it would rest with the shareholders at any time, if they had the money to purchase the prior lien stock, to get rid of the additional ½ per cent. The board were ready to accept those suggestions, and also the appointment of a small debenture-holders' committee, without whose consent they should not be allowed to issue the second £100,000 of the £200,000 prior lien debenture stock unless their net income from investments amounted to £35,000. Another point which was put forward by Mr. Bingham was that the number of trustees should not fall below two, and that in the event of a trustee retiring the debenture-holders should have the right to nominate a second trustee. He could assure them that the present trustees had done everything they possibly could to safeguard the interests of the debenture-holders—they could not possibly be in better hands, and whether it was really necessary or desirable to have a second trustee was for the meeting to consider. With reference to his (Mr. Tuckett's) attitude toward the modifications suggested, and which, he believed, were going to be embodied in the form of an amendment on behalf of the debenture-holders, he had an overwhelming proxy support which it would be possible for him to use in over-riding the will of the meeting, but it would be extremely distasteful to him to take a high-handed course of that kind and impose on them the will of debenture-holders who were not present, and some of whom might have altered their opinions if they were present. Therefore if the meeting honestly preferred the suggestions of Mr. Tuckett in place of those of the board, he (Mr. Tuckett) would cordially adopt the decision of the meeting. It was most desirable and important that they should, as far as possible, be unanimous in carrying their resolution. The directors were not at the end of their difficulties when they had obtained authority to issue the prior lien debentures—they had to place them, and it would greatly strengthen their hands if they had the unanimous approval of the meeting.

Mr. Ansell said that with reference to the suggestion of the appointment of an additional trustee, if he were a personal trustee he would not only accept, but gladly welcome, the assistance of some other gentleman to act with him. It was, however, his duty to tell them, as representing the Anglo-American Debenture Corporation, that they had considered the question of acting jointly with an individual as a trustee, and they saw objections to it.

Mr. Makins said that, speaking for the debenture-holders generally, he believed they were quite satisfied that further capital was necessary in order to further develop the company's business, and to consolidate what they had got. The question arose as to the best form in which that could be raised. They had considered the various suggestions that had been put forward, and they were satisfied that the only satisfactory method was by the issue of prior lien debentures. They then had to ask themselves what was the protection that they, as first mortgage debenture-holders, should have in consideration of postponing their charge in favour of prior lien debentures. One suggestion was that they should have a sinking fund of 1½ per cent., 1 per cent. to be paid obligatory and ½ per cent. if, and when, the profits of the company permitted it. That, no doubt, was some solace to the position in which they found themselves in having to give up what was undoubtedly a very valuable security for the moment. The view that some of the debenture-holders took was that instead of having ½ per cent. on the additional sinking fund, they should have an increased rate of interest—*i.e.*, 5 per cent., instead of 4½, and that they should get up their own sinking fund. They also thought, with regard to the prior lien bonds, that there should be some restriction in the date for redemption. At the present time they were to be redeemable at 5 premium throughout the whole term of their existence, and they failed to see why that premium should continue to run when, say, £75,000 of the debentures had been redeemed. He, and those acting with him, thought it would be quite fair that that premium should cease, say after the year 1920, when they would be reduced to £125,000. The first debenture-holders thought they should have some control over the issue. The first £100,000 might very properly be raised at the discretion of the directors, but with regard to the issue of the second £100,000 they felt that they should not be issued until the first debenture-holders' committee had had an opportunity of considering and knowing what had been done with the first £100,000, because unless they got an adequate return for the first issue, it ought to be in their power to stop a further issue. To carry out those suggestions he proposed the following additions to the resolutions of the board:—

Resolution 1.—On the company covenanting to pay on the first mortgage debenture stock on and after July 31st, 1912, out of the surplus profits, if any, and during the subsistence of any portion of the proposed issue of prior lien debenture stock interest at the rate of 5 per cent. in lieu of 4½ per cent., as at present, the first mortgage debenture stockholders agree, in consideration of such increase in the rate of interest payable to them, to the sinking fund for the redemption of the first mortgage debenture stock being limited to 1 per cent. per annum on the total nominal amount of stock outstanding on July 31st in each year, commencing on July 31st, 1912.

Resolution 2.—That the said sum of £200,000 of prior lien debenture stock shall be issued in moieties, the first moiety to be raised at the discretion of the directors and the second either in whole or in part and at such time or times as the committee of the first debenture-holders, hereafter to be formed, may approve, but such approval shall not be withheld if the net annual income from the company's investments amounts to £35,000 at the time the further issue is proposed to be made.

Mr. H. W. F. Harwood seconded the amendments.

Considerable discussion ensued.

Mr. A. Barber very cordially supported the proposal that the debenture-holders' interest should be raised from 4½ per cent. to 5. They, he said, owned practically the whole of the company at the present time—the shareholders, both ordinary and preference, being utterly wiped out. In the interests of the debenture-holders, he thought they ought to have an additional representative on the board, and he thought that Mr. Page, who was a very large holder, would be a most suitable director.

Mr. Bingham said he thought it would be admitted that good had resulted from adjourning the meeting last week. The additional ½ per cent. was the only real concession that the debenture-holders were to have. They had been asked to make a very important concession, and no *quid pro quo* was offered them for it. It was by no means a settled question whether they had not the legal power to foreclose. Of this he was quite certain—that morally they had the right to foreclose, owing to the mismanagement that had taken place, and the concern really belonged to them.

Mr. Crosthwaite questioned whether it was good policy for the debenture-holders to have another ½ per cent. interest instead of allowing the extra money to remain in the sinking fund.

Mr. Tuckett, replying on the discussion, said that with regard to the appointment of an additional director, the whole question of the re-constitution of the board was gone into most carefully by the shareholders' committee which reported in February, and they, after the most careful consideration, came to the conclusion that it was desirable to restrict the board to three at present. He could not agree with Mr. Barber that the capital of the shareholders had entirely gone. It was very much in jeopardy, and it was not intact, but he did not see why the progress of the company in the future should not be steady, although slow, and he believed that five or ten years hence, the condition of the company would be very different from what it was at the present time.

The resolutions as amended, were then put to the meeting, and carried unanimously.

The debenture-holders' committee was appointed, consisting of Mr. Bingham, Mr. Page, Mr. Makins, Mr. Hedges and Mr. Trueman Mills.

Calcutta Electric Supply Corporation, Ltd.

The directors' report for 1907 states that the progress of the company continues satisfactory. 5,487,883 units of electrical energy were sold during the year, an increase of nearly 20 per cent. over the sales for 1906. The gross revenue amounted to £103,360, compared with £89,242 in 1906. The working costs were £46,084 compared with £39,065 in the preceding year. This increase in working costs is due chiefly to the large increase in the cost of coal. The capital expenditure on December 31st last amounted to £604,348, an increase of £59,994. The following figures show the comparative results for the past four years:—

Year.	Houses.	Equiv. connections in 8-c.p. lamps.	Units sold.	Gross revenue.	Net revenue.
1904	1,814	163,853	2,760,457	£60,243	£36,406
1905	2,451	215,018	3 548,229	£72,591	£43,242
1906	3,060	262,893	4,578,380	£89,242	£50,176
1907	3,721	320,863	5,487,883	£103,360	£57,275

Exchange is calculated at 1s. 4d. per rupee.

In order to meet the constantly increasing demand for electricity the directors recently offered to the shareholders for subscription 20,000 5 cent. preference shares of £5 each. These have all been subscribed and allotted. During the year the sum of £19,016 has been expended in the renewals of mains, which amount has been charged to the depreciation and renewals account. The directors being of opinion that the time had arrived when the company should manage its own business, they determined the agreement of the managing agents as at December 31st last. Offices have been opened at No. 6, Dalhousie Square, Calcutta, and Mr. Frank Rawson,

C.M.G., has been appointed agent and manager of the company. Since the close of the financial year the number of applications from new consumers has largely increased. The new comprehensive licence, referred to by the directors in their report of April 19th, 1905, was granted by the Government on July 31st, 1907, and by the terms of this licence the company's statutory powers are continued until determined by purchase of the undertaking either by the Government or the local authority, which purchase can be effected on October 20th, 1918, or at any recurring period of 10 years thereafter. The net profits for the year amount to £57,276, to which has to be added the balance brought forward from last year £4,230, and after deducting the interim dividend at the rate of 6½ per cent. per annum paid in November, 1907, and other items set out in the net revenue account, there remains an available surplus of £44,850. The directors recommend that £17,000 be placed out of the profits to the credit of the depreciation and renewals accounts, and that a final dividend at the rate of 9½ per cent. for the half-year be declared and paid on the ordinary share capital, making with the interim dividend, 8 per cent. for the year, the balance of £5,305 being carried forward.

Perth (W.A.) Electric Tramways, Ltd.

THE directors' report for 1907 shows that the gross receipts were £75,042, as compared with £78,543, the net profit being £31,177, against £35,261. The traffics for 1906 were favourably affected by an exhibition which was held at Perth. After payment of interest and sinking fund on the first and second debenture issues and trustees' fees for the year, the balance at credit of profit and loss account is £13,656, which is carried to profit allocation account. To this is added £790, balance brought forward, making £14,446, from which has to be deducted £6,000, dividend paid on preference shares for the year, leaving £8,446. Out of this, £1,500 has been expended on capital account in respect of new car barn, new machine shop, &c., and will be carried to reserve account of undivided profits as in former years. It is proposed to apply to reserve account (expended in extensions, &c.), £1,500; to put to cash reserve fund, £1,000; to pay dividend on ordinary shares at 5 per cent, £5,000; and to carry forward £946. A total of £23,625 has now been expended out of profits on capital account. A contract has been entered into with the owners of the Nedlands Park Estate to operate a tramway now being built to connect with the company's system. The whole of the money required for the Nedlands Park Tramway has been subscribed by Perth citizens.

Mr. H. J. Somerset, the manager and engineer, in his report, states that during 1907 no construction work was carried out, but during 1908 certain lines will have to be laid. During 1907 1,178,716 car-miles were run, as against 1,167,763 in 1906; and 7,790,934 passengers were carried, as against 8,083,315. The earnings per car-mile were 15·17d., as against 15·97d., while the expenses were 8·29d., as against 8·3d. The expenses were 54·7 per cent. of the earnings, as against 51·94 per cent. The receipts showed a decrease, due to a slight depression prevailing in Perth. It is only a matter of a year or two before Perth will again go forward. The total mileage constructed is 26 miles 60 chains.

Western Telegraph Co., Ltd.

THE ordinary general meeting was held on Wednesday, May 13th, at Electra House, Sir J. Wolfe Barry presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, May 8th, page 789), said he hoped the shareholders would consider the accounts satisfactory. Although the message revenue had only increased by slightly under £2,500, it must be remembered that during the period under review they had been working under normal business conditions, and that the receipts had not been inflated by exceptional circumstances such as those which to some extent prevailed in the latter part of 1906. In South America generally, politics', financial and commercial matters appeared to be steadily and surely advancing towards the still greater prosperity which undoubtedly awaited that great continent, so richly endowed by nature and possessing statesmen eminently qualified to administer its resources. The revenue since January 1st this year had been so far satisfactory. It was with much regret that they had to report the death in November last of their old colleague, Mr. John Coppen, who was a director of that company and of the Western and Brazilian Co. for fifteen years. Mr. John Gordon had been appointed to the vacancy. He was until lately a member of the important firm of Edward Johnston & Co., of Rio de Janeiro and Santos, and was eminently qualified to assist in furthering the interests of the company, having resided for many years in Brazil, and possessing an intimate acquaintance with that country and its requirements. Mr. Gordon was at present in Rio Janeiro, and among other affairs necessitating his presence there he was engaged on matters of importance to the company. The deputy-chairman, Sir J. Denison Pender, and Mr. Johnston, one of the directors, were attending the Conference in Lisbon. The total expenses showed a decrease of £1,232 compared with the corresponding period of 1906. General expenses in London had increased by £95, expenses at stations by £1,113, salaries and wages were higher by £1,322, due to annual promotions and an increase in the staff. Maintenance of landlines and electrical expenses were augmented by £1,146. The gross increase in the expenses was £3,703, but there was a gross decrease in other items of £2,590. Other expenses showed a net decrease of £5,020, due to their being no expense corresponding to that incurred in 1906 in connection with concessions for new cables. The expenses attending the maintenance of cables were increased by £2,580; 42 more knots of cable, valued at £4,300, were used during the half-year, otherwise a reduction would have appeared under this head. After providing £16,000 for debenture stock interest and £4,464 for income-tax, there remained a balance of £206,487, to which was added the sum of £6,864, brought forward from June 30th last, making a total of £213,351. First and second interim dividends, amounting to £62,579, had been paid, and after transferring £120,000 to the general reserve fund; £5,000 to the maintenance ships' reserve fund; £10,000 to the marine insurance fund; and £10,000 to the land and buildings depreciation fund, there remained a balance of £5,972, which was carried forward to the next account. With regard to the reserve fund investments, the directors had decided, in view of the depreciation of their securities, to provide a sum of £100,000 on account of investment fluctuations whenever it might be found necessary to realise portions of the reserve fund.

LORD BALFOUR OF BURLEIGH seconded the motion.

The CHAIRMAN, replying to questions, said he could not hold out any hope to the shareholders of an increased dividend. They saw before them very large expenditure in the way of renewal of cables. Some of them were 35 years old, and although they had been wonderfully preserved, they could not expect them to go on for ever, and, therefore, they did not think that the reserve fund was larger than it should be if they were to maintain the dividend. As to wireless telegraphy, nothing had happened to cause him to alter the opinion he had expressed on that subject at previous meetings.

The report was then adopted.

Stock Exchange Notices. — The Committee has appointed special settling days as under:—

Thursday, May 28th.—Charing Cross, West-End and City Electricity Supply Co., Ltd.—Provisional certificates fully and partly (50 per cent.) paid, for £301,630 4½ per cent. debenture stock.

And ordered the undermentioned securities to be quoted in the Official List:—

Calcutta Tramways Co., Ltd.—Further issue of 3,176 5 per cent. cumulative preference shares of £5 each, fully paid, Nos. 42,129 to 45,304.

Charing Cross, West-End and City Electricity Supply Co., Ltd.—£111,700 4½ per cent. debenture stock; and provisional certificates, 50 per cent. paid, for £301,630 4½ per cent. debenture stock.

Mexico Tramways Co.—$300,000 additional first mortgage 50-year 5 per cent. gold bonds, Nos. 12,001 to 12,500 for $500 and 31,501 to 32,000 for $100 each.

Walsall Electrical Co., Ltd.—A petition to the Courts for confirming a reduction of capital from £25,000 to £20,620 has been presented.

France.—According to the report of the Société des Tramways Electriques de Lille et de sa Banlieue, the company is now operating 93 kilometres of electrical lines. The receipts last year amounted to £182,167, and the net profit to £72,950, out of which a dividend of 27 fr. per share is being declared.

La Compagnie Centrale d'Eclairage et de Transport de Force par l'Electricité, of Limoges, is declaring a dividend of 6 fr. per share for the last financial year.

West African Telegraph Co., Ltd.—The directors' report for 1907 shows a revenue of £59,206, from which is deducted £15,896 for the ordinary expenses, and £9,878 for expenditure relating to maintenance of cables, leaving £33,431, plus £2,155 brought forward, making a total available balance of £35,586. £1,511 has been provided for income-tax, £24,000 has been transferred to general reserve fund, and an interim dividend of 2 per cent., free of income-tax, absorbing £4,622, was paid on December 2nd. The directors recommend a final dividend of 2 per cent., free of income-tax, on and after 29th inst., making, with the interim distribution, 4 per cent. for the year, the balance of £331 being carried forward.

Castner-Kellner Alkali Co.—The directors have declared an interim dividend at the rate of 10 per cent. per annum for the six months ended March 31st.

Submarine Cables Trust, Ltd.—The annual meeting was held at Electra House on May 12th. The Marquis of Tweeddale presided, and the report referred to in our issue of May 8th was adopted.

Cape Town Consolidated Tramways and Land Co., Ltd.—This company's annual meeting was held on Tuesday at the London Wall Buildings, E.C., Mr. R. Littlejohn presiding. The report (see ELECTRICAL REVIEW, May 15th) was adopted.

Underground Electric Railways Co. of London, Ltd.—It is announced that over 90 per cent. of the notes having been deposited under the scheme recently referred to, it will be proceeded with. The time for depositing notes with the London and Westminster Bank is extended to 29th inst.

Marconi's Wireless Telegraph Co., Ltd.—At an extraordinary meeting held on May 18th, the increase of capital resolved upon at the annual meeting was confirmed.

Prospectus.—*Rosario Electric Co., Ltd.*—This company has this week been offering for subscription an issue of 5,000 6 per cent. cumulative second preference shares of £5 each.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	May 13	2,683 — 6		50	67,362	— 1,316	14·4	..
Ayr	,, 16	466 + 8		52	14,664	+ 77	8	..
Bath	,, 16	1,471 — 82		19	11,830	— 1,194	18	..
Belfast	,, 15	7,288 — 78		7	24,926	+ 587	37	..
Birkenhead	,, 17	2,168 + 112		7	7,004	+ 319	13·52	..
Birmingham Corp.	,, 9	12,504 + 372		6	35,702	+ 1,536	56·46	..
†Blackburn	,, 13	1,169 + 82		7	8,131	+ 128	14·13	..
Blackpool Corp.	,, 14	1,080 + 37		..	4,499	+ 813	11·87	..
,, – Fleetw'd.	,, 16	704 + 41		18	5,643	— 240	8·25	..
Bolton	,, 17	4,672 + 280		7	15,161	+ 1,202	26	..
Bournemouth	,, 13	2,992 — 195		6	10,244	— 503	21·5	..
†Bradford	,, 9	4,487 — 182		6	25,164	+ 1,970	54·9	1
Brighton	,, 17	1,550 — 289		7	5,445	— 27	9·5	..
Bristol	,, 15	9,709 — 386		..	..	..	12·21	..
Brit. Elec. Trac. Co.								
Airdrie	,, 8	431 — 8		18	4,033	+ 61	3·65	..
Barnsley	,, 8	315 — 8		,,	3,079	+ 234	..	..
Barrow	,, 8	488 — 28		,,	4,046	+ 38	5·37	..
Cavehill	,, 8	147 + 12		,,	1,383	+ 82	..	..
Devonport	,, 8	926 + 59		,,	7,848	— 55	8·85	..
Gateshead	,, 8	1,865 — 182		,,	17,962	+ 273	11·25	..
Gravesend	,, 8	881 — 74		,,	3,468	— 546	6·5	..
Greenock	,, 8	1,012 — 310		,,	8,787	— 2,407	7·25	..
Hartlepool	,, 8	375 — 148		,,	3,825	— 765	6·72	..
Kidderminster	,, 8	173 — 29		,,	1,604	— 147	..	..
Leamington	,, 8	293 + 20		,,	2,518	+ 43	3	..
Merthyr	,, 8	401 — 13		,,	3,632	+ 39	2·9	..
Metropolitan	,, 8	10,516 +1,770		,,	90,181	+16,685	22	..
Middleton	,, 8	632 — 13		,,	5,872	+ 78	8·5	..
Mid. Joint Com'tee	,, 8	11,211 — 135		,,	100,285	— 153	..	..
Oldham—Ashton	,, 8	1,112 — 60		,,	10,542	+ 5	9·13	..
Peterborough	,, 8	220 — 14		,,	1,969	— 41	5·21	..
Potteries	,, 8	3,431 — 225		,,	33,151	+ 419	29	..
Rothesay	,, 8	217 — 37		,,	1,423	— 120	2·75	..
Southport	,, 8	475 — 18		,,	3,968	— 848	3·17	..
S. Metropolitan	,, 8	1,486 — 77		,,	12,426	— 275	..	..
Swansea	,, 8	1,794 + 164		,,	15,719	+ 1,182	5·5	..
Tynemouth	,, 8	299 — 45		,,	2,709	— 331	3·75	..
Weston-s-Mare	,, 6	157 — 24		,,	730	— 103	3	..
‡Worcester	,, 8	564 — 1		,,	4,428	— 53	5·75	..
Wrexham	,, 8	189 + 2		,,	1,736	— 5	..	..
Yorks. Wool. Dist.	,, 8	1,782 — 173		,,	16,631	— 691	17	..
Miscellaneous	,, 8	360 — 86		,,	3,365	— 392	..	..
Burnley	,, 16	2,444 — 70		..	..	..	7·5	..
Burton-on-Trent	,, 17	533 — 33		7	1,775	— 153	9·87	2
Bury	,, 10	2,393 + 450		5½	6,919	+ 1,120	10·5	..
†Cardiff	,, 6	2,096 + 123		6	11,852	— 57	..	..
Carlisle	,, 16	329 — 21		20	3,082	+ 23	..	..
Chatham and Dist.	,, 14	1,902 + 162		19	12,648	— 190	14·37	1·53
Cork	,, 14	959 + 20		19	7,820	— 461	9·89	..
Croydon	,, 15	2,821 — 106		7	8,846	— 650	12	·75
Darlington	,, 16	400 — 58		7	1,466	— 90	..	..
Darwen	,, 15	538 — 17		6	1,676	— 26	4·36	..
Dover	,, 9	864 — 57		6	1,060	— 214	4·76	..
Dublin	,, 15	10 527 —1,082		..	94,212	— 345	54·25	5·5
Dundee	,, 13	2,404 + 179		£2	59,417	+ 2,615	14·5	..
East Ham	,, 16	1,033 — 222		7	5,504	— 437	7·75	..
Glasgow	,, 16	35,144 —1,421		47½	868,714	+14,041	89·25	5·5
Hastings	,, 14	1,934 — 123		..	..	..	..	..
†Huddersfield	,, 2	1,106 + 58		5	8,025	+ 68	28·5	·5
Hull	,, 16	4,820 + 8		7	16,109	— 113	13	..
Ilkeston	,, 13	294 + 6		7	959	— 8	3·5	..
Ipswich	,, 18	725 — 55		7	2,342	— 118	10·5	..
†Kilmarnock	,, 9	150 — 1		51	7,932	— 204	4·26	..
Lan'kshire Trm Co.	,, 14	2 752 + 78		19	21,119	+ 3,047	15·82	3·26
Lancashire United	,, 13	2,589 + 143		19	23,330	+ 1,176	39	1
Leeds	,, 9	12,469 — 381		6	35,781	+ 111	96	6·5
Leicester	,, 16	4,487 — 275		..	..	..	..	..
Leith	,, 9	1,008 + 2		51½	26,341	+ 157	6	..
Liverpool	,, 9	21 586 — 229		19	194,355	— 2,003	104	..
‡L.C.C.	,, 2	64,917 +6,122		4½	1 7,050	+14,782	119 5	6
London United	,, 16	13,217 — 122		..	109,178	— 2,687	..	..
Lowestoft	,, 16	317 ..		33	5,143	+ 135	3·5	..
Manchester	,, 16	29,646 + 61		7	98,147	+ 5,459	86	14
Newcastle	,, 16	7,488 — 694		7	25,278	— 2,873	..	..
Newport	,, 16	1,215 — 18		7	4,493	+ 3	14·5	..
Northampton	,, 15	515 + 23		6½	2,776	— 76	5·5	..
Oldham	,, 17	3 940 + 120		7	15,268	— 201	13·75	..
Pontypridd	,, 16	631 + 140		7	2,458	+ 600	5	1·75
Portsmouth	,, 16	3 707 — 81		7	12,082	— 689	14·5	..
Preston	,, 13	1,450 + 37		..	..	..	..	..
Reading	,, 14	1,949 + 19		6½	3,771	— 84	13·25	..
Rotherham	,, 14	1.184 + 30		6½	3,782	— 7	10	·66
Salford	,, 11	9,199 + 123		6	27,022	— 599	38·9	..
Sheffield	,, 17	11,421 + 270		7½	41 899	— 1,486	15·76	..
Southampton	,, 13	2,105 + 202		6	6,655	+ 274	..	..
Southend-on-Sea	,, 13	689 + 18		7	2.114	+ 26	..	..
Sunderland	,, 17	2,277 — 445		7	7,526	— 1,872	..	..
Swindon	,, 13	291 — 19		..	..	..	4·4	..
Tyneside	,, 13	708 — 175		20	6,928	— 1,080	8·67	..
Wallasey	,, 16	1 670 + 101		6½	5,558	+ 115	8·72	·22
Walthamstow	,, 16	1,205 — 35		7	3,900	+ 207	9	..
West Ham	,, 14	4 328 — 439		7	15,007	— 1,641	14·7	..
Wolverhampton	,, 13	1,480 + 112		6	5,192	— 7	19·6	..
Baker St.-Waterloo	,, 14	6,160 +1,410		20	61,680	+14,609	4·25	1
Cen. London Rly.	,, 16	12 629 + 677		20	120,293	— 2,999	5·77	..
Char. +, Eus. Hamp.	,, 16	6.600 ..		20	63,825	..	7·75	..
City & S. Lon. Rly.	,, 17	5,964 + 114		20	65,552	+ 6,555	7 3	1·05
Dublin-Lucan Rly.	,, 15	248 + 26		20	2,039	+ 84	7	..
G.N. and City Rly.	,, 16	3,169 — 200		20	34,641	— 2,203	3·5	..
G.N., P'dy. & Brmtn.	,, 16	11 130 +3,000		20	108,460	+31,741	9·25	·25
L'pool Overh'd Rly.	,, 17	2,822 — 162		20	27,761	— 471	6·8	4·3
Mersey Railway	,, 16	3 793 + 74		20	38,364	+ 1,622	4 5	..
Metropolitan Rly.	,, 17	30 864 + 407		20	305,015	+ 2,9:8	24·5	..
Met. District Rly.	,, 16	17 975 +2,250		20	177,589	+19,515	24	..
Anglo-Argentine	,, 13	39.102 +4,250		19½	352 335	+39,263	42	..
§Auckland	Apr. 24	11,783 + 801		16⅔	48,883	+ 5,749	19·2	·56
§Brisbane	,, 20	14,460 +1,801		..	..	..	..	..
Buenos A.& Belgr'o.	May 13	8.114 + 387		19½	72,208	+ 731	..	..
Calcutta	,, 16	6,076 + 87		..	..	..	..	..
§Geneva	April	7 609 + 553		..	..	..	..	..
§Kalgoorlie, W.A.	,,	8,721 ..		16	15,040	..	20·5	..
Madras	May 15	1.292 + 120		20	11,550	+ 1,185	19·75	..
†Perth (W.A.)	,, 8	1,879 + 20		19	26,903	— 951	25·6	25·6

Compared with the corresponding period of 1907. † One week only.
Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

THE advent of summer has brought more cheerfulness, and even an increase of business to the Stock Exchange. Under the genial influence of the sunshine, and the persuasive force of cheaper money, both investment and speculative descriptions are recovering strength, while a slight cessation of the stream of new issues gives the markets a welcome rest from fresh burdens.

Debenture stocks are favoured in the price-lists this week, small advances being recorded in many cases. Otherwise it must be admitted that with few exceptions, the electrical sections have not participated to any marked extent in the greater access of strength noticeable elsewhere.

Central London Railway stocks have moved into prominence again this week, and it is argued that the fiasco which attended the opening of the Franco-British Exhibition will be quickly forgotten after the visit of the King and the French President next week. The Ordinary stock rose 5, and the Deferred 2 points. Owing to the difficulty of negotiation, Central London stocks generally move sharply when they change at all. So limited is the market in the issues that two or three thousand pounds of either of the stocks would easily cause the quotation to alter a point, if not more.

City and South London Ordinary stock put on 1, while Metropolitans and Districts are both substantially better, the last two because of the opening of the Military Tournament on Thursday. London is expected to be very full this summer on account of the unusually large number of exhibitions, conferences and the like, which are being held in the Metropolis. From these sources the various underground railways are not unreasonably expected to derive considerable increments to their ordinary traffic.

The proceedings in connection with the London and District Electricity Supply Bill continue to arouse great interest amongst proprietors of shares in the metropolitan companies, but the fall in prices has been checked. Brompton Ordinary lost 5s., the price dropping into line with that of the Preference shares. Kensington and Knightsbridge Ordinary are 10s. lower. Metropolitan Ordinary recovered a third of the previous fall of 7s. 6d., but the Preference shares are 2s. 6d. lower.

Edmundson's Debenture stock is nominally 14½ points higher. The width of price quoted—65 to 75—affords some idea of the unreliable character of the quotation. Under the new scheme, which has now been passed, it is hoped that the company will be able to regain some of its former prosperity. County of Durham Ordinary and Preference shares have fallen sharply.

Great is the gamble in Anglo-American Telegraph Deferred stock. This week the price shows a rise to no less than 16½. Strenuous efforts are being made to advance the price still further, "on merits," as it is said. What the people think of the excuse who sold a short time ago and now are being squeezed for their temerity, is a matter admitting of little doubt. The price may go higher, but it would be a risky thing to buy the stock at the current level. Both the other stocks of the Anglo-American Telegraph Company are slightly better, but in neither Ordinary nor Preferred is there the speculation which has been the cause of the jump in the Deferred.

Other trans-Atlantic cable shares are without alteration.

Eastern issues are a trifle dull; a fall of 2 points reduced Eastern Ordinary to 131½. Eastern Extension shares show a loss of 10s., of which 6s. 6d. is accounted for by the deduction of the dividend and bonus. West Coast of America shares fell 2s. 6d., half of it being the dividend. Several debenture stocks record gains of a point or so.

There is no change in Marconi shares on the confirmation of the resolution authorising the creation of £250,000 new capital.

National Telephones are better, the Preferred, Deferred and 4 per cent. Debenture stocks all being 10s. up. Oriental Telephone Ordinary and Preference are *ex* dividend, which has made slight change to the prices. American Telephone and Telegraph capital stock remains at 120, but the 4 per cent. Bonds are rather lower on the week.

Traction varieties have several advances in their catalogue. Anglo-Argentine Trams are stronger, and British Columbia Deferred rose 3 upon the glowing accounts cabled as to the prospects in the Dominion for the coming season. British Electric Traction Preference rallied 2s. 6d., despite the grave doubts entertained about the payment of the next dividend on the Preference shares. Dublin United Ordinary are good. A rise of 2 in the profit-sharing notes of the Underground Electric Railways of London testifies to market satisfaction at the new scheme having received the adhesion of proprietors holding 90 per cent. of the stock. It is believed, and hoped, that the public participation in this "investment" is quite a small matter.

Edison & Swan shares have declined, and manufacturing issues, as a whole, incline to the dull side. Dick, Kerrs are 1/6 easier, and so are Cromptons. A similar fraction was lost by British Westinghouse Preference. Callender's are 5s. lower. Babcock and Wilcox Ordinary, on the other hand, have regained the 2s. 6d. which they shed a week ago.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations May 12th.	Closing Quotations May 19th.	Business done week ended May 19th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cen £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2 — 3	2 — 3	..	..	..	Nil
143,300	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	84 — 87	84 — 87	..	..	..	5 14 11
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	7½%	8 %	8 %	118 —122	118 —122	..	..	..	6 11 2
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	85 — 87	88 — 86	..	..	−1½	4 13 0
622,600	Anglo-American Telegraph	Stock	2¾%	3½%	3½%	3½%	55 — 58	57 — 60	58½	56	+2	5 16 8
3,188,700	Do. do. do. 6 % Pref.	Stock	5½%	6 %	6 %	6 %	98½—101½	100 —102	101½	99½	+ ½	5 17 8
3,188,700	Do. do. do. Deferred	Stock	Nil	⅜%	1⅜%	1 %	14½— 15	16½— 16⅝	16½	14⅝	+1⅛	5 19 5
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	98½—101½	98½—101½	100½	..	..	4 18 6
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7 — 7½	7 — 7½	..	..	..	5 6 8
2,300,459	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	84 — 87	84 — 87	84	..	..	4 12 0
16,000	Cuba Telegraph	10	5 %	5 %	5 %	..	7½— 8½	7½— 8½	..	..	..	6 1 3
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	15½— 16½	15½— 16½	..	..	..	5 19 5
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	8½— 8¾	8½— 8¾	..	..	..	5 14 8
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99½—102½	99½—102½	..	..	..	5 18 8
60,710	Direct United States Cable	20	3½%	4½%	4½%	..	13⅜— 14	13⅜— 14	13⅜	..	..	6 12 2
53,700	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99½—101½	100 —102	..	..	+ ½	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	131 —136	129 —134	133	130	−2	5 4 6
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%	84 — 87	86 — 86	86	84½	−1	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101½	100⅝	..	3 18 5
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	13 — 13½	12⅞— 13¼	13⅛	12⅝	− ¼	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101⅛	100½	..	3 18 5
286,800	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	99 —101	99½—100½	..	..	+ ⅛	3 19 7
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	98⅝—100⅛	99 —101	..	..	+ ⅛	15 17 0
181,127	Globe Telegraph and Trust	10	5⅜%	5⅜%	5½%	..	9½— 10½	9⅜— 10½	10	9⅜	..	5 7 4
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	13½— 14	13½— 14	14	13⅜	..	4 5 9
150,000	Great Northern Telegraph, of Copenhagen	10	24 %	24%	20 %	20 %	29 — 31	29 — 31	..	..	..	6 9 0
24,300	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99½—101½	100 —102	..	..	+ ½	4 8 3
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	..	53 — 56	53 — 56	..	..	..	6 13 11
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	58 — 63	58 — 63	..	..	..	5 11 1
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	62 — 66	62 — 66	..	..	..	6 1 3
384,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅜— ½	⅜— ½	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	⅜— ½	32/- 1 3/32	19/-	..	..	4 14 1
86,492	Do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	1 3/32— 1 1/16	1 3/32— 1 1/16	..	..	..	5 6 8
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107½—109½	108 —110	109½	108⅛	+ ⅛	5 9 1
3,341,425	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	109 —111	109½—111½	111	109½	+ ½	5 7 7
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10½— 12⅝	11	..	..	4 16 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10½— 12⅝	..	..	..	4 0 0
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜— 5⅝	5⅝— 5⅝	5⅝	..	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red.	Stock	3½%	3½%	3½%	3½%	98 —100	98½—100½	98½	98	+ ½	3 9 8
1,710,093	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	101½—103½	101½—103½	102	..	..	3 17 4
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¼%	7 %	8 %	8 %	1⅝— 1⅞	1 5/16— 1 7/16	26/6	26/3	— 1/16	5 17 5
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	6 %	1¼— 1½	1 7/16— 1 7/16	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	90 — 93	90 — 93	..	..	..	4 6 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
11,889	Reuter's	8	5 %	5 %	5 %	5 %	7½— 8½	7½— 8½	7½	..	..	4 19 3
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
3,167	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	126 —129	127 —130	128	..	+1	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6 — 6½	6⅝— 6⅝	..	..	..	6 0 9
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4½— 5½	5⅛— 5⅛	5⅛	5	+ 1/16	4 13 0
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	2½%	..	1⅛— 1⅜	1⅛— 1⅛	..	..	— ⅛	3 1 6
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98½—101⅛	99 —102	..	..	+ ½	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13½— 13⅞	13½— 13⅝	13⅛	13 1/16	..	5 1 10
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100 —102	100 —102	100⅜	..	..	3 18 5
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	1/16— 1/8	1/16— 1/8	11/8	..	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	..	8½— 8¾	8½— 8¾	..	..	..	9 2 10
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	..	8½— 9	8½— 9	..	..	..	Nil
80,000	D do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	101 —104	101 —104	..	..	..	4 16 2

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	9 %	7¼— 8½	7¼— 8½	8	7 1/16	..	5 10 9
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	5½%	6½— 6⅝	6 3/16— 6 7/16	6 7/16	6 11/16	+ 1/16	4 4 3
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	135 —140	137 —142	..	..	+2	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	104 —107	104 —107	..	..	..	4 13 6
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	20 %	8½— 8¾	8⅝— 9⅛	75/7½	72/6	..	5 6 8
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	3½— 3¾	3¾— 3⅞	..	..	..	9 13 1
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	4 — 4½	4 — 4½	87/6	..	..	7 15 7
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4½— 5½	4½— 5½	..	..	..	5 14 3
20,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	8½— 4½	8½— 4½	..	..	+1½	4 14 1
238,200	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	101 —104	102 —106	..	..	..	4 14 4
800,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	..	..	..	5 18 6
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	8 %	129 —132	132 —135	133	131½	+3	6 1 3
800,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	111 —115	111 —115	110½	..	..	4 6 11
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	107 —111	108 —112	..	..	+1	4 9 3
285,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	100	5 %	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 8 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	40	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 2
133,301	British Electric Traction	100	4½%	4½%	4½%	4½%	1½— 1⅝	1½— 1⅝	30/-	25/-	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	3 %	Nil	Nil	3⅛— 4⅛	3½— 4½	81/3	76/3	..	14 10 10
1,448,653	Do. do. 5 % Perp. Deb. Stock ..	10	6 %	6 %	6 %	..	88 — 92	88 — 92	90½	..	..	5 8 8
410,178	Do. do. 4½ % 2nd Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	67— 71	67 — 71	68⅛	..	..	6 14 4
100,000	British Insulated and Helsby Cables	100	4½%	4½%	4½%	4½%	6½— 6⅝	6½— 6⅝	6⅝	..	..	7 10 11
100,000	Do. do. 6 % Cum. Pref.	5	8 %	8 %	10 %	..	6½— 6⅝	6½— 6⅝	..	..	..	4 18 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	5	6 %	6 %	6 %	6 %	5⅝— 6¼	5⅝— 6¼	..	..	..	4 5 9
212,000	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 11 10
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	100	4½%	4½%	4½%	4½%	93 — 98	93 — 98	..	..	..	
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	5	Nil	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	— 1/16	Nil
50,000	‡Browett, Lindley & Co., Ord.	100	4 %	4 %	4 %	4 %	45 — 50	45 — 50	48	..	..	8 0 0
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	Nil	2½%	Nil	Nil	0 — ⅛	0 — ⅛	2/6	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	2	6 %	6 %	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	6 0 0
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	7 10 0
100,000	Buenos Ayres & Belgrano, 1 to 100,000	Stock	4½%	4½%	4½%	4½%	55 — 60	55 — 60	..	..	..	3 1 6
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	4 %	3 %	3 %	..	4⅛— 4⅞	4⅛— 4⅞	..	..	..	5 17 1
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4⅝— 5⅛	4⅝— 5⅛	..	..	..	5 17 1
310,000	Do. do. 5 % Deb. Stock	5	6 %	6 %	6 %	6 %	4⅝— 5⅛	4⅝— 5⅛	..	..	..	4 6 2
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	110 —116	110 —116	..	..	..	4 15 3
137,610	Calcutta Trams, 1 to 137,610	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	4 8 11
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,330..	5	8 %	8 %	8 %	6 %	6 — 7	5⅞— 6⅞	6 1/16	5⅞	— ⅛	4 13 0
850,000	Do. 4½ % 1st Deb. Stock..	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 4 11
35,000	Callender's Cable Construction shares	100	4½%	4½%	4½%	4½%	103 —106	103 —106	105	..	— ⅛	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	12½%	15 %	15 %	15 %	10½— 11½	10 — 11	..	..	..	4 5 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	5	5 %	5 %	5 %	5 %	5½— 5⅝	5½— 5⅝	..	..	..	4 2 11
491,222	Cape E Trams., 1 to 491,222	Stock	4½%	4½%	4½%	4½%	106½—108½	106½—108½	107	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	5 %	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	5 11 4
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	1	4 %	6 %	8 %	..	1 1/16— 1 1/8	1 1/16— 1 1/16	28/6	28/-	..	4 6 7
1,893,610	Central London Railway, Ord. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	103	101⅝	..	3 13 2
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	3 %	74 — 77	79 — 82	81	75½	+5	4 9 11
558,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	4 %	87 — 89	87 — 89	87½	..	..	3 7 10
1,480,000	City and South London Railway	Stock	4 %	4 %	2 %	2 %	54 — 57	56 — 59	57	55	+2	5 1 2
		Stock	2½%	1⅞%	2½%	2½%	39 — 41	40 — 42	42	40	+1	

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations May 12th.	Closing Quotations May 19th.	Business done week ended May 19th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	*	2½%	2½%	5 %	5 %	1 9/16 — 1 13/16	1¾ — 1½	..	..	— 1/16	8 13 11
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 200 of £100, and 201 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1¾ — 1⅞	1 15/16 — 1 15/16	..	..	— 1/16	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1¼	1 — 1¼	..	..	..	4 16 0
282,580	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	100—103	100 —103	99/9	..	..	4 7 5
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6¼%	12½ — 13½	12½ — 13½	..	..	..	4 18 2
59,987	Do. 6 % Pref. between1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	1/8 — 1/4	1/8 — 1/4	..	..	— 1/8	15 10 0
17,139	Do. "A" shares, 9l—017,189	5	2½%	4½%	4½%	4½%	1½ — 2½	1½ — 2½	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	78 — 81	78 — 81	..	..	..	4 18 9
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	85 — 87	85 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	Nil	Nil	1¼ — 1½	1¼ — 1½	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7½ — 8¼	7½ — 8¼	..	..	..	6 1 8
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	87 — 90	87 — 90	..	..	..	4 8 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	3½%	2 — 1½	2 — 1½	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 —103	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10½ — 11½	10½ — 11½	11	..	..	8 13 10
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	4½ — 5⅛	4⅝ — 5⅛	5⅛	..	..	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	5 %	10%	10 %	..	15⅞ — 16⅛	15½ — 16½	16 3/16	..	..	6 1 8
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	Nil	Nil	1½%	1⅜ — 1½	1⅜ — 1½	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5½ — 6½	5½ — 6½	..	..	+ ½	8 0 0
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	..	6⅝ — 6¾	6½ — 6¾	..	..	..	4 8 11
399,980	Do. do. 50,008 to 100,000	10	6 %	3 %	3 %	..	6⅝ — 6¾	6½ — 6¾	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	6¾ — 7¼	6¾ — 7¼	..	..	..	6 9 0
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	80 — 85	80 — 85	..	..	..	4 14 2
5,732,062	Metropolitan Consolidated	100	3 %	2¾%	1 %	¾%	43 — 44	44½ — 45½	45⅛	43 5/16	+ 1½	1 2 0
2,640,914	Do. Surplus Lands	100	2¾%	2¾%	2¾%	2¾%	66 — 68	66 — 68	67⅛	64 5/16	..	4 0 11
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	11½ — 12½	13 — 14	13⅛	12 5/16	+ 1½	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	1/16 — 3/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — 1/8	1/16 — 1/8	15/8	..	..	6 8 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	95⅛	..	..	4 12 9
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	4 %	¼ — ⅜	¼ — ⅜ xd	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	¼ — ⅜	¼ — ⅜	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	91 — 94 xd	..	..	..	4 18 9
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	29 — 31	29 — 31	..	..	..	7 0 0
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —103	100 —103	101⅛	..	..	3 17 8
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Ntz.	..	5 %	5 %	5 %	5 %	36 — 40	38 — 42	..	..	+2	11 18 2
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	3/16 — 1/4	3/16 — 1/4	..	..	..	8 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	3⅛ — 3¼	3⅜ — 3⅝	67/6	..	..	7 10 0
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	77 — 77	77 — 77	..	..	..	5 1 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	94½	..	..	4 10 11
30,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10½	10 %	7 — 8	6⅞ — 7⅞	7¼	..	— ⅛	6 9 0
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6¾ — 7⅞	6⅞ — 7⅞	7	..	..	4 10 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	99 —102	..	..	+ 1	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅛ — 3⅜	3⅛ — 3⅜	66/8	..	..	6 16 4
80,090	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3¾ — 4¼	3¾ — 4¼	..	..	..	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	62/6	..	..	4 0 10
49,486	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3⅛ — 3⅜	3⅛ — 3⅜	..	..	..	6 4 2
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9¼ — 10¼	9⅛ — 10⅛	9⅜	..	..	5 17 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	..	..	..	4 12 4
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	124 —127	124 —127	..	..	..	3 18 9
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	3 — 3⅜	2⅞ — 3	..	..	— ⅛	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	4⅛ — 4⅜	3⅞ — 4⅛	80/-	..	— ⅛	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅜ — 8⅛	7⅜ — 8⅛	7⅞	..	..	6 1 6
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	..	..	..	5 6 8
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	108¾	..	..	4 1 10
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	11 0 0
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	½ — 1	½ — 1	..	..	..	12 0 1
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	53 — 58	65 — 75	66	..	+15	6 0 0
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
15,000	Hove, 1 to 15,000	5	8½%	9 %	9 %	8½%	6⅜ — 6⅝	6⅜ — 6⅝	..	..	..	6 13 4
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	7⅜ — 8⅛	7 — 8	..	..	— ½	6 5 0
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 0 10
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	1 — 1¼	1 — 1¼	..	..	..	5 0 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜ — 4⅝	4⅜ — 4⅝	92/6	..	..	6 3 1
74,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4½%	4½%	90 — 93	90 — 93	..	..	..	4 16 9
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6¾%	4⅛ — 4⅜	4⅛ — 4⅜	92/6	..	+ 1/16	6 13 4
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 5	4⅜ — 4⅝	87/6	85/-	— 1/16	4 12 4
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —111	107 —111	108½	..	..	4 1 1
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 90	85 — 90	..	..	..	3 17 9
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	4 5 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	5⅜ — 6	5⅜ — 6	..	..	..	6 13 4
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	4 10 11
10,362	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	11½ — 12½	11½ — 12½	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅝ — 6⅜	6⅛ — 6⅜	..	..	..	5 9 10
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 98	94 — 98	..	..	..	4 1 6
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7½ — 8¼	7½ — 8¼	..	..	..	6 3 1
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6½ — 7	6½ — 7	..	..	..	5 0 0
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	85 — 90	85 — 90	86⅜	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 8 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅜ — 2½	2⅜ — 2½	..	..	..	6 19 2
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅜ — ⅝	⅜ — ⅝	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	⅞	..	..	5 6 8
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	100	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1 — 2	1 — 2	..	..	..	12 10 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅜ — 2⅛	1⅜ — 2⅛	37/6	35/-	..	11 1 10
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	87 — 90	87 — 90	..	..	..	5 0 0
110,000	Westminster Electric Supply, Ord.	5	14 %	18 %	12 %	10 %	7½ — 8	7½ — 8	7⅞	7⅜	..	6 5 0
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	4⅜ — 5⅛	4⅜ — 5⅛	5 1/16	..	..	4 5 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount 3 per cent. March 19th. 1908.

METER TESTING.

[COMMUNICATED.]

The question of meter testing, although it is a vital one for every station for the supply of electricity, either for lighting or power, is one which cannot be settled by laying down a hard and fast organisation for all stations, although a full and proper scheme for meter testing, inspection and overhauling is the commencement of commercial organisation of such a system. The very size of the station is one of the most essential factors, and personal idiosyncrasies of chief and staff render the development of a uniform organisation impossible. While it must be admitted that every case demands its own solution, it is possible for a more or less routine method to be adopted to some extent by all stations, so that when the inevitable change of staff occurs from time to time, the meter man starting with a new station has not to learn a complete series of new methods, nor has the chief to teach an otherwise intelligent newcomer the peculiar points necessary to his own system.

It should be fully recognised at the outset that meters are almost human in their tendency to err, and that, if to be correct is divine, then meters have a long way to go. When one reads the yearly reports of electricity stations, and notices the number of units unaccounted for, the inference is borne in upon one that there are losses apart from mains and transformers which can very largely be looked for in the meters.

One point to remember is that the meters on consumers' premises are not the only culprits, but those on the generating sets and registering the main output of the station are equally liable to error, so preventing the staff from arriving at the proper ratio between units accounted and unaccounted for. Some time ago, the meters in a provincial station of medium size were tested and were found to vary from 8 per cent. to as much as 30 per cent. on the slow side. As, however, this was an alternating-current station, this slowness was a providential arrangement to balance many losses, but it was not particularly good for some of the station records. This evil arises more especially where the station is supplying current for tramways and is being paid for energy supplied on a meter basis. It is essential that a correct register should be made, and in order to get reliable figures one meter alone should not be relied upon. If the load is very fluctuating it will be found that different types of meters will give varying records on a traction load, while if tested on a constant load they will possibly all give the same accurate reading. This has been actually known to occur. In such cases it is a good policy to have three meters in series; either the average reading should be taken as the correct one, or one meter should be looked upon as the standard, the other two serving as a check to indicate any erratic behaviour. This method could with advantage be adopted for all station meters, because it would then be possible for the testing to be carried out without having to waste large amounts of current in the test room to which the meters would have to be periodically removed in order to subject them to time tests. This arrangement sounds at first rather costly, but it would not be necessary to have three meters on each and every machine. If several generating sets are of the same size, arrangements can be made for periodically putting two other meters in circuit with the one which is constantly in use on any particular machine, for it is seldom that meters will get very incorrect in such a short period as would occur whilst the meters were being changed on to the other machines.

Testing terminals on the machines for such purposes could also be used for testing large meters for consumers, and so a big dissipation of energy in the test room would be avoided.

As regards consumers' meters, however, the adoption of the series method is impossible, and other means have to be adopted. In central stations of large capacity with many consumers it is commercially possible to have an elaborate test room with a skilled set of meter testers, but in a small station the man responsible for the meters has in all probability other duties of a multifarious nature to occupy his time. In such stations it is impossible to lay down the law that the meter man must be an exclusive specialist on that subject, as it may not be possible for him to occupy his time fully on such work. Whether the station be large or small, however, the proper testing and inspection of meters is possible and necessary.

The important starting point is the qualifications of the meter man; many men of the present day entrusted with the care of meters are those whose little knowledge together with undoubted common sense has enabled them to pick up "all about meters." Granting that this may be all right in some exceptional circumstances, the time required to gain this knowledge is somewhat prolonged. It would be a very desirable procedure to engage a man from the meter testing and repairing department of the works from which the majority of the meters used on the supply system were obtained, for in almost all stations it will be found that one type of meter has a preponderance over others. If this cannot be satisfactorily arranged owing to the fact that there already is a man on the works staff pottering about with the meters, it would be money well spent for the supply authority to send this man to the manufacturers' works for a month or two, in order to learn the right way of setting about overhauling and adjusting such meters. Whether in large or small supply stations, it is essential that the meter man shall be able to carry out not only routine testing, but any small repairs that are necessary.

Having obtained the man, it is next essential that he have good and reliable instruments of full range suitable for his work: ammeters, voltmeters, and wattmeters are cheap enough at the present day, and there should be no cheese-paring in this department. Having got together the nucleus of a small testing outfit, the meters themselves should be recorded from the day on which they arrive from the manufacturer until the time they are consigned to the scrap heap. This will save endless work and confusion. All data as to fixing and removing from consumers' premises, readings on such occasions (apart from the monthly or quarterly meter readings) the reason for removal, all records of tests and corrections, together with other necessary information regarding the meter, should be carefully entered up in a book for the purpose. New meters should have a rough test made on them before being taken out to be fixed, and if possible another test should be taken when the meter has been installed, because of the fact that some meters suffer in being carried about and roughly handled in the process of being fixed. When a meter is once put into commission and is working satisfactorily, it should not under normal circumstances require retouching for, say, three years, but at the end of that time it may with advantage be tested again to see if it is retaining its correctness.

There are two things which will cause a meter to be re-tested, apart from its usual periodical tests: either that the consumer complains that his bill is wrong and that his meter is incorrect, or that the office staff, when making up the account, notice a big discrepancy between its reading during a certain period and those of other corresponding quarters. In either of these cases the matter should be inquired into, and the meter tested. A point arises here in which a little sagacity should be used. When once a meter has been installed every endeavour should be made to avoid removing the meter to the testing room for overhauling, except in exceptional cases. Not only is extra cost incurred by the removal, but the consumer becomes somewhat perturbed, as he only relies upon what he is told and sees, and feels much more satisfied if his meter is attended to on the spot. Moreover, a meter put in to replace another may be equally in error after leaving the testing room. The test on the site may be accomplished by the meter inspector if he takes a resistance and instruments with him when he goes out to see a faulty meter. Under these circumstances, one is sure of having the test under the actual conditions in which the meter is working. The necessary corrections can be made, and the meter can be left in order without any jolting. If the meter is a large one installed for power measurements, a water resistance can always be rigged up on the premises, while for small lighting meters a bank of lamps makes a very convenient form of resistance. It should be remembered, by-the-by, that the energy con-

sumed for testing purposes should not be inadvertently added to the consumer's bill, but either the meter should be reset or a reduction made.

It is a point of greatest importance to make a consumer feel a sense of security in his meter registration. Any manipulations, such as changing meters, making allowances on the bill to keep the consumer quiet (especially if the allowance is not due to him), all create a sense of distrust in the electric meter. It should be carefully remembered that all special tests and corrections, whether carried out on the consumers' premises, or in the test room, should be entered up religiously in the book concerning that meter, inasmuch as such notes will go a long way towards helping to trace trouble that may arise later on.

Such a system as the one outlined above can be very easily and simply carried out systematically, provided one has a good man on the staff who understands meters; the few shillings a week paid to a competent man will save pounds by having units registered by correct meters, and it is penny wise and pound foolish to fumble along in the old-fashioned way so depressingly common in many of our smaller stations.

LIVE-STEAM FEED HEATING.

By ALBERT JONELL.

An article on this subject appeared in the January number of the *Engineering Magazine*, under the name of Mr. A. H. Gibson, M.Sc., A.M.I.C.E., who writes very glibly about the old-fashioned engineer and the present nebulous state of the science of steam raising. It may be pointed out in passing that such references are, to a great extent, peculiar to people who indulge in the luxuries of the latest improvements (?) in the science of steam raising, just as the convert is all aglow with enthusiasm, and looks askance at the older faith. The present writer is well aware of the nature of the complaint, as he has passed through the crisis himself.

The reasons which are advanced in support of the claims for this system are the poorest to be found in the whole science of steam engineering. Why? The simple explanation is that they are erroneous, and the wonderful economies claimed for the system have no foundation in fact and actual experience.

Reference is made to the experiments conducted by the late Sir Wm. Anderson. Anyone who reads those experiments correctly will observe that they have not the slightest bearing on the question of heating feed-water by means of live steam. We know that water in a state of ebullition absorbs heat units at a more rapid rate than when it is being heated on the lower ranges of temperature. It is a physical property of water, but no sound argument can be drawn from it to support the claims of the system.

What do those experiments show? A change in temperature of the boiler plate, and a physical change in the water, which consists in the water changing into steam.

What is the action taking place? A molecule of steam is developed between the boiler plate and the water. A medium of a more attenuated form is interposed between these two substances.

If the water is taken away altogether from the boiler plate, and a more attenuated medium interposed, the temperature of the plate increases to a higher mean temperature, accordingly as the nature of the medium allows of radiation.

Does not this seem to indicate that at the moment of steam generation, a decrease in the mean temperature of the furnace plate *does not occur*, but, on the other hand, an increase takes place, and the molecule of steam has a temperature which is a mean between the temperature of the boiler plate and that of the water?

This mean temperature of the steam at the moment of eneration is the "Initial temperature of steam," and will, f course, vary with the boiler pressure.

Granting that these assumptions are correct, the only conclusion possible is that at the moment of steam generation the furnace plate does not undergo a cooling action, but, on the other hand, increases in temperature.

If a cooling action occurs on the surface of the furnace plate in contact with water when steam is generated, a thermometer should indicate it if placed in the water and in contact with the plate. The fact that an increased temperature is registered by suitable apparatus indicates fairly well that there is a very considerable increase in the temperature of the plate at the moment of steam generation.

Increased Heat Transference.—Mr. Gibson argues that there is an increase in the transmission of heat through the boiler plate when using live steam, and consequently a decrease in the terminal temperature of the flue gases must take place. He says:—"This transference will be greater as the temperature of the water surface diminishes. Any cause tending to lower this latter temperature will, by causing an increased flow of heat through the plate and a consequent reduced rejection of heat in the flue gases, increase the efficiency of the heating surface and generally the efficiency of working."

The only criticism on this class of reasoning that can at all meet the case, is to say that the premises are wrong; and the simple fact that no decrease is observable in the terminal temperature of the flue gases disposes of it altogether.

When live steam is used and the water in the boiler is raised to steam temperature, the terminal temperature of the flue gases, if anything, increases by about 10° F., and we know that that is indicative of decrease in boiler efficiency.

The sum total of this matter is that no responsible engineer has yet come forward who has made "scientific research" on this subject for the benefit of the profession, but sufficient information has been accumulated to show very clearly that there is no saving in the coal consumption.

Thermal Storage.—There are distinct advantages obtainable by this system, but they do not extend to the coal bill. They are confined to the benefit obtained by feeding boilers with high-temperature water, when as much as 25 per cent. increased steaming capacity may be obtained, and the number of boilers thereby reduced; or to meeting sudden demands, such as occur in generating stations and some industrial enterprises. Now that engineers are able to gauge its proper value, they are not likely to encourage the spread of the system by trying it.

When people make statements of immensely increased evaporative efficiency of boiler plant—increasing the duty of a 12,000-lb. boiler to 36,000 lb.—a staid and old-fashioned engineer may open his eyes with surprise, but the young and enthusiastic engineer may easily be misled.

Boiler Efficiency.—What is usually understood by efficiency in connection with boiler plant is the capacity of a boiler to evaporate x lb. of water per lb. of coal. If a man comes along and states that he can double the steaming capacity of the boiler, and give an increased efficiency, it is understood that the coal bill will be reduced.

If $x + x$ lb. of water were evaporated for $x' - x'$ lb. of coal, increased efficiency would have been secured. Certainly $x + x$ lb. of water can be evaporated in the same, or less, time by thermal storage, but to do that the boiler has been steaming for a longer period, and $x' + x'$ lb. of coal have been burned. The log books will show whether increased boiler efficiency has been obtained, and they, and the engineers with whom the writer has discussed this question, all agree that there is no increase in boiler efficiency.

In boiler capacity for higher duty for a decreased period there is a gain, but the increased capacity does not carry with it any reduced coal consumption.

Mr. Gibson states that some wonderful results have been obtained in Russia on locomotives, showing 23 and 26 per cent. economy on the fuel consumption. In England only 4 to 12 per cent. has been obtained. Why this difference in the operation of boilers in one country and another?

Our locomotive engineers are not altogether so foolish as to throw away the benefits of a system that will secure to them 25 per cent. reduction on their fuel consumption, and the simple fact that they do not generally adopt thermal storage is sufficient *prima facie* evidence that there is a missing link in the claims put forward for that system.

Mr. Gibson states also that "priming is largely prevented by the increased uniformity of working of the boiler,

a factor which is of great importance in most boilers of the water-tube type." What is it that causes increased activity of the steam traps under the increased uniformity of working? Why, priming, to be sure; and the disappearance of water from the boiler is mistaken by the live-steam advocate for *increased boiler efficiency*.

The writer may remark that under *equal conditions of firing* the increased evaporation, when feeding a boiler with steam-temperature water from thermal storage tanks, is approximately 26 per cent. over the same boiler fed with cold feed-water at about 60° F. He carried out experiments some time ago to ascertain the difference in evaporation, and the results were as given above. For higher evaporations the fuel consumption must, of course, be increased, and most engineers are aware that increase in the rate of firing over normal evaporative duty means decrease in efficiency.

Thermal storage has advantages worthy of consideration under certain conditions, but other systems of live-steam heating do not appear to have any.

Since the above was written, a paper on this subject has been read by Prof. Goodman of the University of Leeds, before the Mechanical Engineers, describing trials made on a boiler fed with live steam-heated water. The results fully confirm the conclusions of the writer, and bear out the contention that no economical gain in fuel consumption is obtained by heating the water by means of live steam.

These trials by Prof. Goodman leave no doubt on the matter, and entirely clear the air of the theories and explanations which have at one time and another been put forward to account for the alleged economy.

PROCEEDINGS OF INSTITUTIONS.

The Manufacture of Carbide of Calcium and Ferro-Silicon.

The progress made in the employment of large electric furnaces for the manufacture of carbide of calcium and high-percentage silicon formed the subject of a paper by Herr W. Conrad, of Vienna, which was presented at the general meeting of the Association of German Ironfounders, held at Dusseldorf on May 2nd. Since the reaction in the carbide trade in 1900 and 1901, the author pointed out that the industry has slowly recovered with some difficulty, and it now possesses a basis of constantly increasing latitude founded upon the consumption of acetylene on a small scale. Not only so, but great hopes are entertained for it in the future, owing to the growing development of the branch for the production of artificial manure of the nitrogen class. During the period of the crisis the carbide works looked around in search of another means of utilising the plant at their disposal, and after various mistakes they arrived at the possibility of producing ferro-silicon. Although the processes are fundamentally different from each other, it is possible to carry them out with the same equipment, it only being necessary to make an alteration in the structure of the furnace, which, apart from this, has to be periodically renewed. As the experience gained in the one branch of manufacture has been utilised in the other, it may be said that the construction of the furnace of the present day is a result of both processes, and they therefore deserve to be discussed together.

The production of 1 ton of chemically-pure carbide of calcium requires the employment of 17½ cwt. of lime and 11½ cwt. of solid carbon. In the case of 1 ton of silicon it is necessary to use 2 tons 2¾ cwt. of chemically-pure quartz and 17½ cwt. of reducing carbon, and iron can be added in a convenient quantity, and is to be found completely in the finished product. During the course of the operation both processes exhibit material differences. As the calcium oxide easily decomposes in the electric arc, and the impurities in the raw materials in the presence of the excess of lime form a readily fusible slag, the carbide process is substantially a melting process. The lime melts, without a pulpy intermediate stage, into complete liquidity, and dissolves the carbon present down to a convenient degree of saturation. All impurities are dissolved in the lime bath, and there arises a bath of calcium carbide, which is easily fusible, and which can amount to several tons in a large furnace.

The manufacture of ferro-silicon, on the other hand, has the character of a toilsome process of reduction. At a high temperature, melted quartz resembles a bath of glass in its obstinacy to liquidity. It is only when the reduction to silicon takes place through the presence of carbon that an easily fusible product is formed; but, owing to its low specific gravity, it has difficulty in passing through the resisting mass of quartz to the bottom of the furnace. This operation is facilitated by the addition of iron, which, having a greater specific gravity, takes up and carries with it the ferro-silicon in flowing through the mass in the furnace. In the carbide process the impurities are washed out of the furnace simultaneously with the liquid carbide, whereas in the ferro-silicon process they remain behind and form a highly siliconised slag which it is difficult to liquify. Lime or other basic flux cannot be employed, as they would only produce more slag. The removal of the slag from the furnace requires trouble and care, and if not carried out at the right moment, the furnace becomes full of slag which cannot be cut out. The only thing then to be done is to stop the operation, open the furnace, break out the slag and build the furnace up afresh.

The principles which are determinative in the construction of large carbide and ferro-silicon furnaces at the present time, according to the author, are as follows:—(1) The electrodes must be able to burn freely the furnace charge surrounding them. By freely burning is implied the melting away and evaporation of the material directly touching the electrode, so that a gas mantle of several millimetres density is formed around the electrode. (2) The most durable furnace lining is obtained by the chilling and slagging of the melted furnace charge, and adequate cooling is required for the maintenance of the furnace wall. (3) A base connection, that is, the leading in of the current at the bottom of the furnace, is to be avoided where possible. The first experiments to produce ferro-silicon with units of several thousands of horse-power, were made in three-phase furnaces, which, although now abandoned, represent the starting point of the new industry.

The decisive portion of the cost of manufacture, in the opinion of Herr Conrad, is formed by the consumption of energy. In well managed works a kilogramme of carbide requires the use of 4 KW.-hours, and a kilogramme of silicon 12 KW.-hours, so that 6 kg. of carbide, or 4 kg. of ferro-silicon of 50 per cent. purity, can be produced per KW.-day. The hydro-electric works in the Alps and in Norway work at a power cost of from 16s. to £2 per ton of carbide produced, and at from £1 4s. to £3 per ton of 50 per cent. ferro-silicon. But large water-power works are frequently unfavourably situated, both for obtaining supplies of raw materials and for effecting sales of manufactures. Thus the works using steam power within the sales area (market) have an advantage in the matter of freight which works out somewhat as follows:—To produce 1 ton of carbide, 2 tons of raw materials are necessary, and 2·7 tons of materials are required for 1 ton of 50 per cent. ferro-silicon. As a consequence, each ton of finished product implies the transport of from 3 to 4 tons to and from the works, which means at a low estimate a freight rate of 10s. per ton. The steam power establishment working in the area of the market therefore enjoys a freight superiority represented by from £1 10s. to £2 per ton of manufactures as compared with a hydro-electric works, although the cost of power may be higher to this extent—namely, ·7 pfennig, as contrasted with from ·4 pfennig to 1 pfennig per KW.-hour in the case of hydro-electric works. A further advantage in the case of carbide lies in the packing in air-tight soldered metal drums, which cost £1 5s. per ton of carbide. Nothing of this can be regained after long journeys, whilst where the destination is not far distant, it is possible for the works to secure the return of from one-half to two-thirds in a serviceable condition. This means an economy of 10s. per ton, or one of ·25 pfennig per KW.-hour. In the case of ferro-silicon, it is of great advantage for the ironworks to have the production of such an important material effected on the site of the works. So long as the carbide and ferro-silicon industries only yielded slight profits, the cost of power was so determinative that the competition of steam-working with water power was out of the question. But in consequence of the progressive improvement of the process, the profits have so advanced that, by utilising steam turbines and having a favourable supply of raw materials, both methods of manufacture are able to prosper in the coal and iron districts; in fact, carbide works are already being built in the coal-producing region.

The present prospects of the market are materially different for the two products. The imports of carbide into Germany exhibit a constant increase, this being attributed to the growing expansion of lighting on a small scale, and to the employment of acetylene for welding, heating, cooking and chemical purposes. In addition to this, the calcium cyanamide industry, after overcoming the juvenile defects of manufacture, will call forth a vast consumption of carbide. As a contrast to the uniform development of the carbide market, that for ferro-silicon is subject to extraordinary fluctuations. The crisis in the iron and steel industry in the United States caused the consumption of ferro-silicon on that side of the Atlantic in 1907 to be merely a small fraction of that which obtained in 1906. Reductions in prices also are unable to produce any revival in the demand. It is, however, one of the soundest traits of the German iron and steel industry, to devote periods of involuntary leisure to the purpose of perfecting the manufacturing plant, in order to be able to develop its forces still more powerfully on the beginning of the next upward period of prosperity. In this sense the author suggests that the establishment of carbide or ferro-silicon works should be taken into consideration for the profitable utilisation of surplus power in the present condition of trade, as this would be of permanent advantage, both to the iron and steel industry and to the two electro-chemical processes in question.

Continuous Oscillations and Their Uses.

At the meeting of the Röntgen Society on May 7th, Dr. Horace Manders gave a lecture-demonstration of continuous electrical oscillations and their uses in medicine, wireless telegraphy, and wireless telephony. In advocating the use of continuous oscillations in therapeutics, Dr. Manders said that the feature which struck one most in this method was the absolute silence of the system. There was no long spark to cause alarm, and no noise to terrify the nervous. He particularly emphasised the value of continuous high frequency in rheumatic arthritis. Although the intermittent high frequency gave decided relief, yet long-continued

treatment for many hours or days was necessary to do any real good, because, in intermittent high frequency, for one period of activity there were 499 similar periods of abeyance, so that during treatment lasting 20 minutes the patient only received active medication lasting one-third of a second. Continuous high frequency, on the other hand, gave a steady stream of oscillations, the time of application was shortened, the efficacy enhanced, and tissues destroyed practically without pain.

With regard to telegraphy, Dr. Manders stated that his own experiments had shown him that for practical use, spark telegraphy was superior to continuous. It was the very delicacy of the tuning which reduced the practical value of continuous waves for wireless telegraphy. At present, with a system of wireless telegraphy based on continuous oscillations, it would be easily possible for two ships, one starting from America and the other from England, not to be able to communicate at any part of the voyage through not being able to pick up one another's tune. With intermittent waves, of course, this danger was far less probable.

It was in wireless telephony, however, that Dr. Manders found the chief value of continuous oscillations. He said that the frequency of waves of human speech was between 2,000 and 4,000 per second. To transmit these it was necessary to have trains of oscillations following each other at a rate of at least 4,000. In spark discharge there was nearly one-hundredth of a second between the trains, so that it was only the fundamental note or pitch of the voice that could be measured. The overtones would not be heard at all. But with continuous trains of oscillations, all that was necessary was to control the energy, or a certain portion of it, flowing into the aerial. This was a difficult problem, and had not yet been fully solved, but it was on the way towards solution.

Dr. Manders described his own experiments in wireless telephony. He dated the first deliberate and successful performance of wireless telephony in Great Britain from December 31st, 1907, when he transmitted and received perfect speech and music across a distance of ½ mile of land, the transmitting and receiving stations being separated by numerous buildings and screened by a multiplicity of telegraph and telephone wires. The transmitting wire on this occasion depended from a kite.

Dr. Manders subsequently carried out a demonstration of wireless telephony during the meeting.

The Tangential System of Suspending Overhead Trolley and Transmission Wires.

By R. N. Tweedy.

(*Abstract of paper read before the* Institution of Electrical Engineers, *Dublin, May 14th*, 1908.)

In the case of a tramway built in 1901 with the best materials obtainable, and on the standard lines of the period, within six years approximately 10 miles of trolley wire have been reduced to scrap. How then are we to reconcile long-term loans or the provision of a minute depreciation fund, with such a rapid destruction of our assets?

In the case of a local authority owning a tramway, loans are never extinguishable under 30 years, so that at the present rate of depreciation the whole of the overhead trolley wire and fittings must be renewed at least four times during the period. It is necessary, therefore, to find some means of reducing this recurring liability to the smallest possible amount.

Stouter wire has in many cases been employed, and 0000 and even 00000 s.w.g. wires are becoming common. Those who do this consider the wire as a feeder, and say it is a good investment; if they did not put it in the air they would have to bury it in the ground as a feeder, and insulate it into the bargain. But is it a good investment to spend, say, £100 in putting up £1,000 worth of copper wire in 1901, to spend another £50 in taking it down again, storing it, advertising it, and finally selling it in 1908 for £500, after paying, say, 3½ per cent. per annum, or about £280, for interest on the original loan, and leaving a balance of £500 of capital, now unrepresented by anything at all, to be a burden on the undertaking for the remainder of the term of the loan?

Again, the trolley wire is subjected to wear and tear, and it becomes cheaper to put down a large underground cable having an expectation of life of 30 years or more, rather than constantly to be re-metamorphosing a finished article into raw material.

I hold that the most economical section of trolley wire is the smallest which it is possible to use with safety, both with regard to mechanical strength and current density. I hardly expect or desire to see No. 0 s.w.g. wire in use again, but so far as mere strength is concerned, No. 0 wire is good enough, so long as it is suspended correctly.

Heavier currents nowadays demand heavier wire, and 00 or even 000 s.w.g., is not unnecessarily large, but the causes which produce fracture and wear at the points of suspension are rather helped than hindered by the introduction of a less flexible wire.

Circular section wire has been condemned utterly for some years past, solely because it wore and weakened at the ears. The wire was not at fault, because the whole trouble arose from two causes, which we will consider.

In the first place, the upward pressure of the trolley wheel on the wire, the vibrations transmitted from the car through the trolley pole to the wire and the vibrations due to wind, keep the wire in a state of almost continual motion, and this is concentrated at every point of suspension, which is very nearly rigid. At these points, therefore, a bending action is set up, and crystallisation results sooner or later. No wire, however ductile, will submit to infinitely continued bending, and hard-drawn copper by no means forms an exception to this rule. A slight skin crack appears generally just under one extremity of the ear, and this develops until a fracture occurs. Clearly in this case, the suspension, not the wire, is at fault. Render it more capable of transmitting freely any vibrations in the wire from one length to another, make it so elastic that the trolley wheel will not be able to bend the wire against it, but will lift it and the wire as a whole, and the process of crystallisation will be spread over a longer period. It is too much to hope that it will vanish altogether.

In the second place, actual reduction of the section of the circular wire occurs near the ears whenever the ear itself presents a section larger than the wire to the trolley wheel, and this is almost invariably the case, for very few people have had the courage to attach ears to the top semi-circumference only of the wire, and of necessity, therefore, trolley wheels have encountered the obstacle presented by the overlapping lips of the ear, and have run off this at the trailing end with a bump on to the wire. Inevitably this produces a depression at the point of impact. Clearly, therefore, this fault does not lie with the circular wire, which now has had its character cleared.

Why, then, has the use of circular wire been suspended?

Not because any other section suffers less from vibratory troubles, for, if anything, they suffer more acutely still, but solely, as it seems to me, because the new sections were designed to enable a non-fouling ear to be used. I use the qualification advisedly, as the ears frequently applied to what is known as grooved wire still protrude into the path of the trolley wheel.

A longer lease of life has been given to overhead equipment since the new sections of wire have become fashionable, but we are far from the highest point which can be reached.

A trolley wire suspended in mid-air by some magic means perfectly horizontal, without attachments, yet perfectly rigid throughout its length, is the ideal. Can we get anywhere near that in practice?

Span wires and "bow-strings" on bracket-arms provide excellent facilities for doubly or trebly insulating the trolley wires, but have little virtue of flexibility.

Mr. Pringle, who realised that crystallation was even a more important factor in the destruction of wire than the bumping and arcing caused by falling ears, sought to combine remedies for both diseases in one system, and has evolved what he calls the tangential suspension system, of which full descriptions have appeared in the technical papers. The main points of the system are:—

1. The use of two or more non-fouling ears soldered to circular wire at each point of suspension.
2. The attachment of these ears to a bracket-arm or span wire by a length or lengths of flexible steel stranded wire.
3. The use throughout of one-piece porcelain insulators.

With regard to (1), the system is applicable equally well to any form of wire, and to any form of ear, but it is believed that no one will desire to use anything but circular wire and soldered ears, if it can be demonstrated that they are at least not inferior to grooved or figure 8 wire and mechanical ears.

The two ears, which are similar in appearance to the ordinary anchor ear, are set about 5 ft. on each side of the arm, and the forces which suspend the wire are almost in the same plane as the wire itself, instead of being quite at right angles. The result is that the wire approaches the ideal of a freely floating conductor, instead of being held in a kind of vice at intervals of 120 ft., free to move neither vertically nor laterally at every one of these points, any attempt at free movement being translated into a hingeing action at the ends of the ears, as stated above.

One of the ears used by Mr. Pringle, when soldered to rather less than half the circumference of the wire, will not release its grip when it is submitted to a tangential pull which fractures the wire. On the other hand, a comparatively small vertical strain, such as would be applied if a trolley head caught between the tangent wire and the trolley wire, is sufficient to peel the ear from the wire.

There is no trap whatever on straight-line work, the tangent wires being in the same vertical plane as the trolley wheel, but the construction at curves undoubtedly introduces this element. Wherever the course of the trolley wire departs from the straight track by more than a few degrees the tangent wires can be no longer in the same vertical plane as the trolley-wheel, and special curve fittings have to be used in order that the ears may remain vertical and non-fouling. The triangle, formed by the trolley wire as its base and the tangent wires as its sides, cants over toward the outside of the curve, the degree of cant depending on the radius of the curve. If a trolley-wheel de-wires at the leading ear there is a distinct chance of its flying up into the triangle with the probability of jamming in the trailing angle. The trolley head immediately pulls the tangent wire downwards, cants the car over until nearly horizontal, and exerts a wedging action between ear and trolley wire which strips the two apart. This is done quite simply and without damage to the wire, as actual experiments made under working conditions have proved.

But the tangential system is its own safeguard, for it smooths out the old angles which used to deflect the trolley suddenly from its path, and makes the course of the wheel over the worst curves almost as sweet as the passage of the car wheels in the still more perfectly-formed curve of the rails. Trolley wheels running on tangentially suspended wires are not subjected to the same temptations to leave the wire as they are with vertical and nearly rigid suspension, and it is most important to realise that de-wiring accidents are reduced both in number and effect by this system.

The tangential system permits the expansion and contraction of the trolley wire due to varying temperature, as well as any undue momentary tensile stress at any part of the wire, to be equalised in a way that is not approachable under present conditions, for the tangent wires pass over the lower reel insulator, and need not be bound to it unless that course is considered advisable.

If the trolley wire breaks at some point in a span, on the rigid system the two ends fall to the road, or as near it as they can. On the tangential system the same thing happens; but in spite of the absence of special anchoring, the wire does not run back to the next section insulator on either side, as the tangent cars cannot get past the suspenders. Every span on each side of the break, right back to the nearest anchorage, takes up its proportion of the sag due to some 5 ft. of wire being slacked off at the two poles between which the breakage occurred, and that is all.

If the trolley wire should break between the two tangents of a suspension, no further damage should happen, as the wire is anchored securely by the cars themselves.

If a tangent ear strips from the wire, it flies back 5 ft. or so to the insulator, and is there held, the trolley wire itself being lowered but little, as the sag is distributed as in the case above.

To get rid entirely of composition insulators, to replace all these by a single porcelain reel, or bobbin, is an incident only of the tangential system, but it is an incident which is an event. There is no question of the mechanical sufficiency of the reel, or of its dielectric strength. There is no chance of dirt staying long on the glazed and wholly exposed surface in our rainy climate, and there is not a great deal to fear from electrolysis, which, on another occasion, I gave reason to believe is a serious enemy to the ordinary form of insulator.

The tangential system can be applied with equal facility to old and new lines, and it is not too much to say that trolley wire which has been anchored and re-anchored until it is about to be condemned, may be preserved for a number of years by the adoption of the new suspension, which not only protects the spots where hingeing, bumping and arcing have weakened the wire, but cures those diseases, and makes a repetition of merely palliative and temporising methods unnecessary.

In my opinion, a great step has been taken towards providing the means for lightening the financial burden, which would continue, under present conditions, to increase year by year.

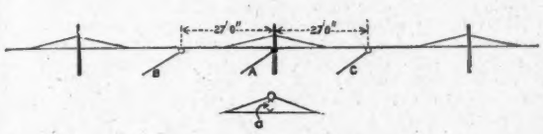
It is gratifying to observe how in a few months the advantages of the tangential system have been acknowledged in a practical manner by our tramway managers and engineers, and Mr. Sheardown has made already an extensive experiment with the system.

In appendices are given the results of tests showing how little the trolley wire is affected by soldering and by ordinary wear, and that round is superior to grooved wire. Tests are also given showing that porcelain insulators give practically perfect insulation under severe conditions of weather, dirt, &c.

More recent tests on the effect of upward pressure from one or more cars are given below:—

FEBRUARY 14TH, 1908.

1. Trolley-wire tight and line level (Trent Bridge).



The clearance—

D, without any cars, was	$1\frac{7}{8}$"	
Car A alone, with 25 lb. upward pressure, gave	$1\frac{5}{16}$"	
B and C cars alone, gave	$1\frac{1}{2}$"	= 13 lb.
A, B and C gave	$\frac{7}{8}$"	= 36 „

2. A, B and C, when in centre of span, as sketch below, gave ... ... $\frac{3}{4}$" = 33 „
B and C, in same manner, gave ... $1\frac{1}{2}$" = 13 „

3. Wire very slack (Guild Street).
Car A gave D ... ... 3" = 25 „
A, B and C cars gave D ... ... 3" = 25 „

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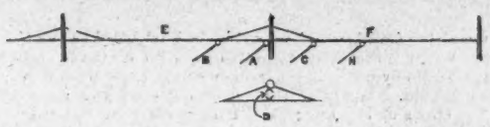
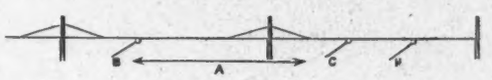
4. Wire taut (Trent Bridge).
D = $2\frac{3}{8}$", with no cars in spans E or F.
= 2" „ A car alone.
= $2\frac{1}{8}$" „ B and C, alone
= $1\frac{3}{4}$" „ A, B and C.
= $1\frac{3}{4}$" „ A, as shown, and B in centre of span E, and C in centre of F.
= $2\frac{1}{4}$" „ same as below, but A away.
To lift trolley wire 4" at A required 76 lb.



ORDINARY SUSPENSION USED AT RIGHT-HAND END POLE.

5. Slack line (Guild Street).
D = 4" with no cars.
= 3" „ A, = 25 lb. upward pressure.
= 4" „ A and B
= 3" „ A, B, and C, = 25 „ „ „
= $3\frac{3}{4}$" „ A, B, C and H = 8 „ „ „
= 3" maximum, when as below, and A travelling backwards and forwards.



A New Type of Electric Furnace for the Smelting of Iron.

By Prof. B. IGEWSKY (Kieff, Russia).

(*Abstract of paper read before the* IRON AND STEEL INSTITUTE, *May 14th*, 1908.)

THE author describes a method of working with high-pressure electric current, of which he has had seven years' experience. The furnace is one of a type employing what may be called second-class conductors, such as magnesia, lime, silicates or their colloids, such as Al_2O_3, $2SiO_2$, which, on being greatly heated, become conductors. It is absolutely necessary that the current should pass in the thinnest possible layer over the lower surface of the bricks. The pressure should be 1,000 volts for each metre space between the electrodes. By bringing the electrodes nearer together, or placing them further apart, or by providing the furnace with a number of electrodes, and only charging those which are immediately needed, it is possible to obtain a furnace which will work with all strengths of current in ordinary use. Such a furnace should work as steadily as an incandescent lamp, and should develop the highest temperature that the bricks can support. The problem is, however, not entirely solved. The electric current only flows over the surface of the brick during the earlier stages; in a very short space of time it concentrates itself along the lines of least resistance. Little by little the path selected becomes the only zone affected and the remaining surface remains quite cool. This differentiation can be obviated by dividing each electrode into a number of smaller electrodes furnished with regulators. Such a system could be employed for the firing, *e.g.*, of porcelain.

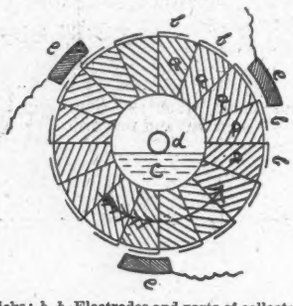
The application of the principle to the manufacture of steel and to the fusion of other smelted materials is more easily solved by the furnace being made to revolve, and supplied with a sufficient number of electrodes, so that the current does not suffer interruption. In such an arrangement the bricks will at one time form the vault and at another the bottom of the furnace. By this means the variations in temperature can be avoided, and each brick passing beneath the metal will have the same conductivity over the whole of the surface as any other brick. In addition to this the bricks will be automatically moistened with slag, so that their surfaces become better conductors than their interiors.

If the principle of a revolving furnace be adopted, it is necessary that it should be furnished with a commutator, otherwise the current will short-circuit through the metal. Fig. 1 (p. 888) shows a plan for a rotating furnace using three-phase current, such as has been installed in the Emperor Alexander II Polytechnic Institute at Kieff. A motor rotates the furnace about twenty times per minute. The furnace is carried on rollers, and can be tilted in order to empty it completely. All the plates are of cast-iron. The inside diameter of the furnace is 175 millimetres, and the depth 215 millimetres. The cubic capacity is 5·17 litres. The space that can be occupied by metal is, however, only about 2 litres, and at the commencement little more than 10 kilogrammes can be charged. In the course of time the interior bricks wear, and the capacity of the furnace becomes greater.

The author prefers a three-phase electric current, but usually employs a continuous current of 250 volts and 50-60 amperes, *i.e.*, 12-15 KW. When cold, the furnace is a non-conductor.

The process of smelting is conducted by heating the interior until the furnace acts as a conductor, and the electric current begins to warm it. When the temperature of the furnace reaches a light red heat cast-iron may be put in, and then scrap, or the order can be reversed.

If a quantity of cold metal be suddenly introduced at one time, it is easy to reduce the temperature to such an extent that short-circuiting occurs by cooled metal which causes the short-circuiting of the electrodes. The same thing occurs if the furnace becomes cool with the metal inside; small furnaces cool down in an exceedingly short time. In a large furnace where there is a considerable margin of heat, such an accident is hardly likely to occur. The outer bricks of the author's furnace are of fireclay, and the inner of fireclay or dinas.



a, *a*, Firebricks; *b*, *b*, Electrodes and parts of collector; *c*, Smelted metal; *d*, Working opening; *e*, *e*, Brushes which remain immobile during the rotation of the furnace.

Fig. 1.

The electrodes are of iron. They melt and become slightly absorbed in the interstices of the bricks. But as the heat is developed on the surfaces of the bricks lining the inner side of the furnace, the crevices around the electrodes remain at a moderate temperature, because they retain the slag and drops of metal which act as conductors. The author at first employed electrodes 3 to 4 millimetres in thickness, so as to drive them into the furnace from time to time by means of a hammer, but as that appears to be unnecessary he now employs thin sheet-iron electrodes. There are in the furnace 24 electrodes placed at intervals of 28 millimetres from each other. As in the furnace filled with liquid steel only the 14 upper bricks constitute the working surface, a difference in potential of nearly 35 volts is obtained between adjoining electrodes. As a result sparks are emitted on the collector on the passing of each electrode, and frequently the spark is transformed into a voltaic arc. To prevent this, each flat piece of the collector is divided into three parts, connected to each other with resistance wires. By these means each electrode becomes gradually shut off whenever the difference of potential reaches the vicinity of 12 volts, and the formation of a voltaic arc is impossible. Besides, a special brush is used which similarly serves to lessen sparking. The method employed to obviate sparking is the only complicated part of the furnace, the remaining principles being quite of an elementary nature. The manipulation of the furnace is likewise exceedingly simple, although with its present very small dimensions it requires constant attention. The softest steel produced possesses an ultimate strength of 56·8 kilogrammes per square millimetre, with an elongation of 20 per cent.

On smelting iron turnings with charcoal (1 per cent.) steel was produced with an ultimate strength of 85·6 kilogrammes per square millimetre, and an elongation of 3 per cent. Experiments for the production of steel from cast-iron by the ore process were also successful, and the fireclay bricks suffered less than might have been anticipated.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Electric Clocks at the New Piccadilly Hotel.

The system of electric clocks installed at the new Piccadilly Hotel is unique in many respects, as it is not only one of the largest single installations of electric clocks existent in one building, but the many special conditions and requirements demanded by the large number of dials to be operated, called for the designing of special apparatus.

The installation consists of some 300 separate dials of different sizes in the various rooms, entrances and lounges. The whole of the clocks are operated from two master pendulums, which, together with the controlling switchboard, are situated in the basement of the hotel.

Fig. 1 shows the two pendulums, encased in either of the side panels. Each pendulum beats seconds, is specially compensated for temperature variation, and carries an extra heavy bob. The centre of the board is occupied with the controlling switches for the six clock circuits, which radiate to the various parts of the hotel. Each circuit is fitted with a change-over switch, so that it can be operated from either master at will, and though normally approximately half the clocks are operated from each master, they can, if necessary, be all controlled from one pendulum. Each circuit has a switch, which will place it in circuit through a milliamperemeter, seen in the middle of the board. Another switch will connect any circuit to a leakage detector, enabling the insulation resistance upon any line to be observed. A pilot dial is also fitted to each circuit, and these, together with the change-over switches, can be seen in the upper part of the board.

Fig. 1.—Master Pendulums and Control Board.

The main circuits for each master pendulum are closed through special solenoid relays. The contacts on the master pendulums close the energising circuits of these relays, and a special device is fitted in each instance to obviate sparking due to the self-induction of the coils occurring at the contacts; in fact, when the whole of the clocks are working, there is no visible sparking whatever.

The dials in the rooms of the suites are shown in fig. 2; although they are only 6 in. in diameter, they can be read from any part of the room, on account of the bold figuring and hands used. The backs of these clocks are enclosed in cast-iron boxes, which contain the movement, and are let in flush with the wall; the conduit tubes carrying the circuit wires are screwed into these boxes, making a watertight and workmanlike job. In operation the dials are absolutely silent, there not being the slighest click or other noise noticeable in the quietest rooms.

Fig. 2.—Dial as Fitted in Rooms.

The movement of the dial is interesting, as, in place of the usual ratchet wheel and pawls, there is a small iron armature having a gradually increasing radius, which, with the assistance of a small weight, causes the armature to revolve a complete turn at each contact of the current. There are no springs whatever used in the movement, which is so powerful and certain in its action that the same sized movement is used to operate all dials up to 18 in. diameter.

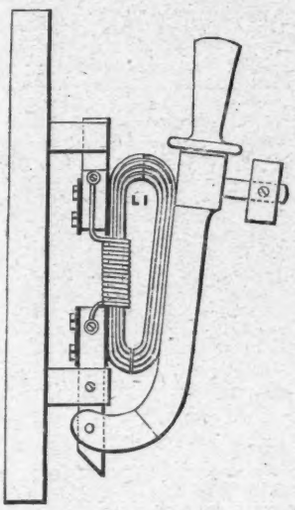
Dials of French finish are used in the entrance halls and lounges, and another type of dial is used in other rooms of the hotel. These dials are of handsome design, in keeping with the decorations.

The whole of this important installation was carried out to the requirements and scheme drawn up by Mr. E. W. Bowles; the clocks are of the patented type designed and made by Mr. G. B. Bowell, of Terminus Chambers, Holborn Viaduct, and were completely made at his works at Margate. The wiring of the clocks was carried out by Messrs. Blackburn, Starling & Co., Ltd.

Minimum Current Cut-out.

A new automatic switch has been brought out by Messrs. Marsh, Son & Co., Ltd., of 11, Upper Priory, Birmingham. It is of the circuit-breaker type, with metal contacts arranged as shown in the accompanying sketch. The feature of this switch is that it has a special magnetic hold-up for the handle lever, which lever is counterweighted; while a current of value not less than the arranged minimum is passing, the magnetism is sufficient to hold up the keeper attached to the handle lever, but when the current passing is less than this minimum, the magnetism becomes too weak, and allows the keeper and handle lever to fall away, the added counterweight on the lever giving sufficient power to open the switch at the contacts, and give a long quick break.

The device is suitable for use in connection with transformers, to break the primary circuit when the load goes off. The switch illustrated (fig. 3) is capable of dealing with 15 amperes at 200 volts on the primary, and can be made to cut out at a current of ½ ampere.



L I, Laminated iron.

Fig. 3.—Automatic Minimum Current Cut-out.

The counterweight is placed on a spindle with a set-screw to allow of adjustment; the coil is of sufficient capacity for the maximum current, and the whole arrangement is strongly made, without any attempt at very high finish. The invention has been protected.

Simplex Fans.

Messrs. Simplex Conduits, Ltd., have just issued a new catalogue of electric fans for the forthcoming season. A variety of

Fig. 4.—Simplex Universal Fan.

types for use in different positions are shown. That appearing in fig. 4 is a D.C. "Universal" used as a "Trunnion" fan.

In the construction of the continuous-current fans, the field frame is of round shape cast-iron, of high magnetic permeability, protected by a highly finished thick coat of enamel. The field coils are securely wrapped with tape, and are form wound of silk-covered wire, the whole being protected by a heavy coat of shellac varnish. These coils are subjected to a severe test at 1,000 volts before leaving the works. The armature, of the ironclad type, is built up of thin iron stampings, drum wound, and the windings insulated from contact with all metal surfaces. Hard-drawn copper is used for the commutator, and the brushes are of graphite, carried in special brush-holders.

Self-aligning bearings are provided on all Simplex fans, and lubrication is effected by means of automatic oil cups which, when once filled, will give efficient lubrication throughout the entire season. Speed regulation is obtained by means of a switch and rheostat concealed in the base of the fan. The guards of all fans are of stout brass wire, and the blades, heavily nickel plated, are carefully balanced to prevent the motor from vibrating.

Alternating-current fans are throughout, unless otherwise specially stated, of the induction type. The armature is constructed of soft-iron laminations assembled on a brass spider and

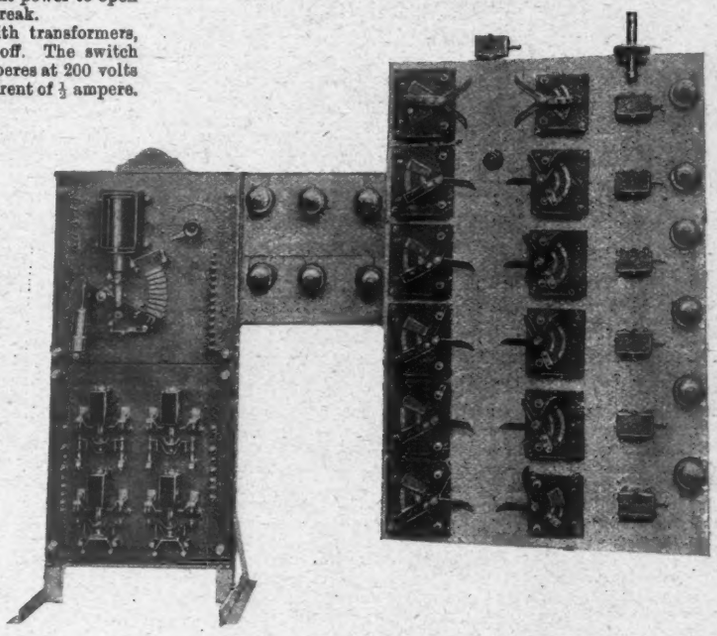


Fig. 5.—"Igranic" Push-Button Lift Controller.

held between copper disks at each end of the core. It is carefully made to size, so as to reduce the air-gap between stator and rotor to a minimum.

The speed regulation on fans generally covers about 300 R.P.M.; for example, on 12-in. fans it is 1,400, 1,300, 1,100, and so on. Most types are supplied with 10-in., 12-in. and 16-in. diameter blades. The standard finish is black enamel, relieved with gold lines.

Push-Button Lift Controller.

In fig. 5 we illustrate a complete "Igranic" push button lift controller for a six-floor lift, made by the Adams Manufacturing Co., Ltd., of Bedford. The apparatus is shown mounted all together roughly on a board for testing purposes. It consists of a control panel, mounted in a convenient form so as to stand upon the floor, six patent magnetic push buttons which are intended to be mounted inside the car, six similar push buttons which are intended to be mounted one upon each floor, at each entrance to the lift, and also six tappet reversing switches, and six tappet switches to ensure accuracy of stopping. There are also seven gate switches, one for each gate giving access to the lift, and one for the gate of the car itself, as well as a floor switch and a small emergency push button, which can be used by the passenger to stop the lift instantly at any position in case of emergency. The tappet reversing switches, as well as the tappet switches for accurate stopping, are operated by the travel of the car itself, so that the operation of this lift is entirely automatic, and does not require the intervention of an attendant, whose services are accordingly dispensed with. The passengers operate the lift themselves.

To call the car, the passenger presses a button. If not already in use, this causes the car to come to the passenger, stop opposite to him, and unlock the gate for him to enter. After entering, he presses a button inside the car which is labelled to correspond with the floor to which he wishes to travel. This causes the car to travel to that floor, where it stops and unlocks the gate for the passenger to alight.

Among the advantages claimed are:—That the lift cannot be started while any gate is open; No gate can be opened unless the car is opposite to it; it cannot be operated from outside while a passenger is in the car, as the passenger has sole control. In case of emergency the passenger can stop the lift instantly by pressing

the emergency button, and can start it again at his pleasure, but it will not start again until he starts it.

"Ediswan" Auto-Transformers.

A recent leaflet (No. E 2,125) issued by the Edison & Swan United Electric Light Co. gives particulars of Ediswan auto-transformers and balancers, and their application to metallic-filament lamp circuits. These transformers, the interior of one of which we illustrate in fig. 6, are specially designed for their purpose, with selected iron cores and carefully insulated windings; the terminals are labelled and the cable entries fitted with

Fig. 6.—"Ediswan" Auto-Transformer with Cover Removed.

insulating bushes. The voltage regulation does not vary more than 1 or 2 per cent., and the power factor is '98 at half and '99 at at three quarters and full load.

These transformers cover a range of from 25 to 100 volts secondary pressures, with periodicities of 40-100, and measure approximately 10 in. × 9 in. × 5 in. over the lugs. It is scarcely necessary to add that the use of an auto or balancing transformer connected between meter and lamps has greatly facilitated the adoption of metal-filament lamps on A.C. circuits.

LEGAL.

City of London Electric Lighting Co., Ltd., *v.* Vanguard Motorbus Co., Ltd.

This case came before the Court of Appeal consisting of the President of the Probate Division and Admiralty Division and Lords Justices Moulton and Farwell on Friday, May 15th, on the application of the plaintiffs for judgment or a new trial on appeal in an action tried before Mr. Justice Ridley and a special jury, and a cross notice of appeal by the defendants.

In this case the plaintiffs sued the defendants to recover the sum £75 10s. 3d., the cost of repairing an electric lighting standard and lamp which were damaged by the skidding of motor-omnibuses belonging to the defendants, owing to the alleged negligent driving of the defendants' servants. In the alternative the plaintiffs claimed that the defendants were liable to pay the sum in question, on the ground that they had committed a nuisance by placing on the highway omnibuses which they knew to be dangerous and uncontrollable. Defendants denied liability.

Plaintiffs' case was that they had statutory powers to supply electric energy and light in the City of London and for the erection of electric lighting standards, and in pursuance of those powers they erected an electric lighting standard and lamp upon a public refuge in Threadneedle Street. On June 15th and 25th, 1907, two of the motor-'ouses of the defendants skidded in passing the refuge and collided with the lamp, causing the injury complained of. Plaintiffs' case was that the defendants had not taken sufficient steps to avoid the risk of 'buses skiddir g against the standard.

On behalf of the defendants, evidence was given at the trial for the purpose of negativing negligence and to prove that omnibuses were liable to skid at the place where the accident happened.

Mr. Justice Ridley held at the trial that there was no evidence to go to the jury of negligence by the defendants with regard to the accident on June 25th, and he left questions to the jury as to whether there was any negligence on the first occasion, and as to whether the omnibuses of the defendants were a nuisance in law.

The jury found a verdict for the plaintiffs on the ground that there was negligence on the part of the defendants' driver on the occasion of the accident on June 15th, but held that the vehicle was not a legal nuisance.

Upon these findings the learned Judge entered judgment for the defendants for £43 3s. 4d., the amount attributable to the first accident. Hence the present appeal.

In the result their Lordships directed that there should be a new trial of the whole action, on the grounds that it was not clear what the jury meant by their verdict, and that there had been an unsatisfactory trial. The costs of the appeal and of the first trial were directed to be left to the discretion of the Judge at the retrial.

Ernest Scott & Mountain, Ltd., *v.* The Kent Collieries, Ltd.

(*Continued from page* 847.)

The hearing was continued on Saturday, May 9th, when Mr. Sayers, who is consulting engineer to the Colliery Co., was again called, and said that the pumps were not in a state efficient enough to submit to a test. Witness was questioned as to the coal consumption, and diagrams taken by plaintiffs' experts and defendants' experts were compared, and found to be substantially the same. The theoretical figures of the steam and coal consumption were also compared with the diagrams, showing that they were in accordance with the latter.

Cross-examined, Witness said that with regard to the motors, his opinion was that in reference to Nos. 2 and 4 it was uncertain whether the water came from the outside or inside. There was not sufficient evidence to show this. He heard that before the motors left the manufacturing works they had been tested to 100,000 volts, but not while current passed through. The destruction was too complete to allow of any evidence that overheating had been going on for some time. No sufficient provision was made for ventilation. Questioned as to the area of cooling surface, witness said that provided in No. 3 exceeded the area in Nos. 1 and 2.

On Monday, May 11th, Mr. Sayers continued his evidence. He said he had no figures of the actual coal consumption from August, 1906, to December, 1907. Answering Mr. Hutchinson, Witness said the mere arithmetical capacity of the cylinder of the engine did not give a conclusive indication of the power of the latter. With regard to the drying of the motors, witness said he was sure that 10,000 volts had never been applied to the two terminals of the machine. What plaintiffs meant when it was stated that the motors were subjected to that test before leaving their shops, was that the voltage was applied between the windings and the iron of the motor, which was only a test of the insulation between the windings and iron of the motor, but was not of the terminals. The moisture in the windings came from internal condensation, for in his examination he found the presence of copper salts on the wires, which pointed to the fact that the windings had not been properly dried. The circumstances of the breakdown of one of the motors also pointed to internal condensation as the cause. The presence of copper salts showed that the moisture must have been in contact with the wires for some time, and then again, if the water came from without, directly the moisture reached the live wire a path of conductivity would have been set up and a breakdown would have occurred immediately. In two of the three motors which he examined there was insufficient cooling. The main cooling factor in motors of this character was the amount of surface for radiation. In the two machines in question the surface for radiation was much smaller than was the usual practice. This was an element distinctly connected with the breakdown. Plaintiffs had undoubtedly relied upon water cooling, and had not taken necessary steps to make the air radiation effective. Of course to be effective a water jacket must be in contact with that part of the machine in which the heat was generated.

Mr. W. M. Mordey, M.Inst.C.E., President Designate of the Institution of Electrical Engineers, and senior partner of the firm of Messrs. Mordey & Dawbarn, consulting engineers, was then called. He stated that he had been connected with electrical engineering for many years and he had given much attention to the testing of machinery and to determining the output, efficiency, and the like. He was called in to make a test of generating plant and one of the electrical pumps supplied by the plaintiffs to the colliery at Dover; also to ascertain whether the plant complied with the specification and tender as regarded the output, the temperature of the alternators and the steam consumption of the engine; further, to find whether the electric pump worked under the specified conditions and was a satisfactory piece of machinery. The generating plant in question consisted of two steam-driven alternators, each set comprising a combined steam engine coupled direct with a three-phase alternator, this generating plant being supplied for driving an electric pump, consisting of a three-phase electric motor capable of driving a centrifugal pump in the shaft. According to the specification the generating plant had to be capable of giving 300 kilo-volt-amperes as a normal full load with a maximum rise of temperature above the surrounding air of not more than 70° F. at the end of six hours' normal full load run. Each set to be capable of an overload 25 per cent. above normal load, or 375 kilo-volt-amperes, to be sustained for half an hour without excessive heating. With regard to the steam consumption, the specification in the contract was that the engine should not consume more than 28 lb. of steam per kilowatt-hour at a pressure of 100 lb. per sq. in. on the stop valve, the engine being non-condensing. The power of each motor was to be 300 H.P. at 1,440 revolutions, and each pump to be capable of raising 1,000 gallons of water per minute, against a head (including friction) of 640 ft., which was equal to a pressure of 277 lb. per sq. in. In order to get a steady, unvarying run to test the output of steam consumption, and the temperature of the alternators witness ran the machinery on an artificial load con-

sisting of water resistance, this method being more favourable to the contractors, and at the same time making it easier to determine the actual electrical output in kilowatts. The steam consumption was determined by carefully measuring water, fed into a set of boilers which had no other duty than to supply the engines; all auxiliary apparatus which required steam was provided for by other boilers. The governors were removed, and the engine run with the throttle valve fully open. These were normal conditions as far as testing was concerned. Witness took all precautions to avoid leakage and to measure any leakage which did occur. The water was pumped into the boilers from a large iron tank which had been carefully measured, and the water level in the boilers was also carefully registered on the gauges. He also put a gauge on the exhaust, and ascertained that there was no back pressure there. The steam gauges on the boiler and engine varied a good deal, there being a difference of as much as 15 per cent. None of the safety valves blew during the test; the pipes from the cylinder cocks were disconnected from the drains and led into buckets, and the steam separators were treated in the same way. The glands were tight, practically no water coming through, whilst very little water leaked through the cylinder drain cocks. This showed exceptional dryness of steam. The test lasted 6¼ hours, and readings were taken every 15 minutes of all electrical quantities, of pressures of steam, of the temperature of the alternators and of the engine room, &c. Readings were also taken from the boiler house of the water consumption, very carefully calibrated instruments being used. The results of the test were as follows:—Maximum kilowatts obtainable, as an average of 10 readings at 100 to 102 lb. pressure, 375 revolutions, 250 KW.; maximum kilowatts obtainable as average of all readings during 6¼ hours at pressures ranging from 97 to 108 lb., 256. Maximum temperature rise attained after 6¼ hours' run on above output on artificial load, 90° F. Witness also tested the electric pump and generator. The generator ran on a load for which it was provided by the contractors, the load on the motor being arranged by throttling the pump to represent slightly less than the specified full load of the motor. The test enabled the temperature of the alternator to be ascertained under working conditions as well as the temperature of the motor. In the case of the generator and electric pump, the test lasted 5½ hours, and then he had to stop, as the motor was getting hot and it would not have been safe to run longer. On an average of 254 kilovolt-amperes, the maximum temperature attained in 5¼ hours was 111·5° F. The steam consumption per kilowatt-hour on an average load of 250 KW. was 44 lb., and the electric pump temperature rose to 117° F. after 5¼ hours' running. At the time of stopping the temperature was still rising rapidly and air was issuing from the motor. This corresponded to a mean internal temperature of 212°. That, of course, was an average; at times during the test it was higher, and at times lower. Such a temperature was not safe and no insulating material that he knew of would stand it for long; also the expansion and contraction of the parts did general damage to the machine. Questioned by Mr. Hutchinson as to asbestos windings, witness criticised them adversely, declaring that they were inflammable owing to the mucilage and cotton stuff used in the composition. After he had made the above tests and presented his reports, the plaintiffs had an opportunity of repeating them and objecting to the arrangements. Mr. Ravenshaw, for the plaintiffs, did make a test, but, according to witness, that gentleman used inaccurate appliances and generally failed to arrive at any correct results. The engines were not capable of doing any more than his test showed, and he had heard nothing to alter his opinion. The alternators were clearly over-loaded, and the question of the 25 per cent. overload was never approached, as there was no possibility of getting it upon the engines.

Cross-examined by MR. RUSSELL, K.C., WITNESS was asked if in 1901 the Committee of the Institution of Civil Engineers carefully considered the question of testing steam engines and boilers. Witness, in reply, said he did not remember. He was not acquainted with the recommendations of that Committee, and he did not know that the recommendations of that Committee formed the recognised standard of testing boilers and engines. Tests were made in various ways. Sometimes they measured the water that went into the boilers, and sometimes they measured the water that came out of the engines. It depended on what condition was the more convenient. Asked as to whether he took the weight of the steam entering the high-pressure cylinder, witness said he took the weight of the steam indirectly. Questioned as to whether he took the pressure of steam on both sides of the stop valves, Mr. Mordey said he did, and he took the readings of the boiler gauges. He found the gauges were wrong, and therefore he took no notice of them. There were three boilers and three gauges, and the gauges gave three different pressures.

The OFFICIAL REFEREE: Were they badly made, or what?—They were either badly made or had gone wrong from some cause or other.

MR. RUSSELL: For testing purposes was steam taken to mean dry steam?—No, but it was taken to mean reasonably dry steam.

Can you suggest any standard for fixing what is reasonably dry steam? Unless in the specification it means superheated steam, the term dry steam, or steam, does not mean literally dry steam. Such a thing does not exist.—WITNESS added that he thought the term dry steam was used in a general sense in the specifications. It meant that the steam must be reasonably dry.

Re-examined: The test he had made was a careful engineering test.

MR. ERNEST GEORGE PINK, examined, said he was a working electrical engineer of 30 years' experience in the working of electrical apparatus. He was put in charge of the plant on behalf of the defendant company. He had co operated with Mr. Morley while he was there on behalf of the plaintiffs. He (witness) was personally under the manager, Mr. Fell. His first entry in the log book was dated March 31st 1907. The readings of the current and voltage were obtained from the engine man. Witness had to work out and record the daily averages. He had no knowledge of any tests being made on December 24th and 31st. On December 24th he had a note that the motor was burnt out at 3.40 p.m., and there was no opportunity of making a test after 3.40 p.m.

Cross-examined by MR. RUSSELL: He was still at the colliery and had charge of the pump No. 2 when he was on duty. Since March 1st the water in No. 3 shaft had been allowed to rise.

On Tuesday, May 12th, MR. JOHN HENRY ROSCOE, secretary of the defendant company, was called, and said that when the colliery was taken over, a capital of £200,000 was raised to work the concern. He had never heard the suggestion that two pumps should be put in the pit to work alternately.

The cross-examination of witness was proceeded with.

On Thursday, May 14th, when MR. JOHN M. FELLS, one of the directors of the defendant company, was examined, asked as to whether liabilities were ever repudiated when the subject was discussed, witness replied that they were not, and in addition, a representative of the plaintiffs said they were not liable for consequential damages. Witness replied that that was a mistake, and emphasised that they were liable. Dealing generally with the matter, COUNSEL asked if there was any need for such a delay as had taken place. In reply, witness said there was no cause for delay that would operate to any appreciable extent. It was impossible exactly to estimate the amount of damage.

MR. W. J. HORNER, another director, was recalled, and questioned as to certain items of account.

MR. RUSSELL, K.C., said he might have to ask leave to call evidence to counterclaim.

The OFFICIAL REFEREE said he was not sure that it was a question of asking him. The counterclaim was said to be in the nature of a cross action, so that he thought Mr. Russell would be entitled to call such evidence as he had indicated.

MR. BOUSFIELD said evidence need not be called on the counterclaim if it was to be merely a repetition of what had been given.

MR. RUSSELL: That is what I want to avoid.

The OFFICIAL REFEREE said he preferred to hear the whole of the evidence before counsel addressed him.

(To be continued.)

BOURNE AND HOLLINGSWORTH *v.* MAYOR AND CORPORATION OF MARYLEBONE.

IN the Court of Appeal on Wednesday, May 13th, Sir Gorell Barnes, and Lords Justices Farwell and Fletcher Moulton concluded the hearing of an application by the defendants for judgment or new trial in this action which was tried before Mr. Justice Ridley and a special jury. The action was brought by the plaintiffs, who carry on business as drapers at 116 to 122, Oxford Street, London, to recover damages for alleged breach of contract. It was contended by the plaintiffs that a contract partly verbal and partly in writing made in June, 1905, between the plaintiffs and the defendants, the latter agreed to supply to the plaintiffs the electric light required by them for their new premises in Berners Street, Oxford Street, and the plaintiffs in consideration thereof agreed to pay to the defendants their charges for the same; that it was an express term of the contract that the supply of the electric light should be at the rate of 240 volts, and that such supply should be given to the plaintiffs' premises by the first week in September, 1905; that the plaintiffs were to fix in the premises electric fittings capable of receiving a supply at 240 volts; that the plaintiffs duly fitted their premises with the necessary fittings, but that the defendants did not, in fact, supply the electric light until October 3rd, 1905. It was further alleged that by a further contract made on September 19th, 1905, it was agreed that if the plaintiffs would adopt the system at their premises by cutting out one of the arc lamps on each circuit, so as to be able to receive a temporary supply of electric light at 200 volts, the defendants would within two days, from September 22nd, furnish a supply at 200 volts, and that the defendants broke the contract. The defendants denied the making of the contracts, and that the persons who made them had any authority from the defendants to enter into them. The question was as to whether engagements or promises entered into by Mr. Wright, consulting engineer to the defendants, and Mr. Wilkinson, resident engineer and manager, were contracts, and whether they were capable of being enforced. These questions, Mr. Justice Ridley said, depended partly on the letters and interviews themselves, and partly on the authority possessed by Mr. Debenham, Mr. Wright and Mr. Wilkinson. He left to the jury questions which were considered as follows:—(1) Did Wright make the alleged contract in June?—Yes. (2) Did Wilkinson make the alleged contract in September?—Yes. (3) Were they, or one, and which of them, authorised to make such contract?—Both. (4) Were they, or one, and which of them, held out by the defendants as so authorised?—Both. (5) Was it necessary that contracts of this kind should be made to carry into effect the purposes of the defendants as electric light suppliers?—Yes. The jury answered all five questions in favour of the plaintiffs. The learned judge, after hearing arguments on the questions of law raised in the case, gave judgment for the plaintiffs, being of opinion (1) that the contracts were binding on the defendants, although they were not made under seal; (2) that they were not *ultra vires* of the defendants; and (3) that as the action was founded on a breach of contract, and not on a breach of a

statutory obligation, the defendants were liable in damages, and not to the statutory penalty. He, therefore, held that the plaintiffs were entitled to judgment for the agreed sum of £500 and costs. Hence the present appeal of the defendants.

Mr. Montague Shearman, K.C., and Mr. McCardie, who appeared for the appellants, contended that there was no evidence of any contract either in June or in September, and that if there was evidence of such a contract, there was no evidence of any authority in Wright or Wilkinson to make such a contract.

Mr. Montague Lush, K.C., and Mr. J. W. Crawford, for the respondents, submitted that upon the evidence and correspondence there was evidence upon which the jury could find that there was a contract either in June or in September, and that Wright and Wilkinson had implied authority to make the respective contracts.

Sir Gorell Barnes, in giving judgment, said it seemed to him there was no evidence which the learned judge ought to have left to the jury entitling them to give the answer they did to the first question. There was a verbal conversation on May 30th which was to be considered by Mr. Wright, who then wrote a letter. The construction to be placed on that letter was one entirely for the judge, and not for the jury, and the letter was not capable of the construction which plaintiffs sought to place upon it. The letter contained no binding promise that the work would be done on September 1st. As to the question of whether Mr. Wilkinson was authorised to make the second contract, or held out by the defendants as having authority to make the second contract, Sir Gorell Barnes said it seemed to him that Wilkinson had no such authority. He could find no trace of any authority for Mr. Wilkinson to make such an exceptional contract. The result, therefore, was that there was no evidence to support the finding at which the jury arrived as to the alleged first contract, and if there was a second contract then there was no evidence which could reasonably be submitted to the jury that Mr. Wilkinson could himself make it, or had been held out by the defendants as having authority to make it.

Lords Justices Moulton and Farwell concurred.

The appeal was accordingly allowed, and judgment entered for the appellants with costs.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

9,630. "Improvements in hand-fed arc lamps." J. Bonn and A. E. Jones. May 4th.

9,636. "Improvements in fittings for glow lamps." Siemens-Schuckertwerke G.m.b.H. (Date applied for under Sec. 91 of the Act, June 25th, 1907, being date of application in Germany.) May 4th. (Complete.)

9,637. "Improvements in dynamo-electric machines fitted with commutation poles." Siemens-Schuckertwerke G.m.b.H. (Date applied for under Sec. 91 of the Act, May 16th, 1907, being date of application in Germany.) May 4th. (Complete.)

9,638. "Improvements in three-phase commutator machines." Siemens-Schuckertwerke G.m.b.H. (Date applied for under Sec. 91 of the Act, July 13th, 1907, being date of application in Germany.) May 4th. (Complete.)

9,639. "Improvements in charging and discharging switches for electric cables and the like." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) May 4th. (Complete.)

9,640. "Improvements in switching apparatus for controlling electrical machinery." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) May 4th. (Complete.)

9,654. "Improvements in miners' electric lamps." P. M. Justice. (Deutsche Gasglühlicht Akt-Ges. (Auerges), Germany.) May 4th.

9,675. "Improvements in electricity meters." E. Evans. May 4th. (Complete.)

9,676. "System of electro-magnetic transmission." P. Fromaget. (Date applied for under Sec. 91 of the Act, May 4th, 1907, being date of application in France.) May 4th. (Complete.)

9,678. "Improvements in and relating to means for insulating electrical conductors." J. F. Gilmore. May 4th.

9,695. "Improvements in apparatus for the production of electrotypes and for electroplating." S. O. Cowper-Coles. May 4th. (Complete.)

9,697. "Improvements in electric switches." The Thames Iron Works Shipbuilding and Engineering Co., Ltd., and W. H. Flood. May 4th. (Complete.)

9,698. "Improvements in apparatus for the production of electrotypes." S. O. Cowper-Coles. May 4th. (Complete.)

9,756. "Improvements in and relating to switches for electrical circuits." J. D. Hilliard and C. E. Parsons. May 5th. (Complete.)

9,762. "Improvements in the manufacture of electrical resistances." C. Ruzicka. May 5th. (Complete.)

9,763. "Improvements in the manufacture of electrical resistances." C. Ruzicka. May 5th. (Complete.)

9,780. "Improvements relating to motors of small starting torque." H. A. Jones, The Phœnix Dynamo Manufacturing Co., Ltd., and R. Pohl. May 5th.

9,789. "Improved variable speed gear for electric automobiles." C. M. de Sainte-Claire. (Date applied for under Sec. 91 of the Act, August 17th, 1907, being date of application in France.) May 5th. (Complete.)

9,790. "Improvements in and connected with electric and other cables." W. T. Henley's Telegraph Works Co., Ltd., and J. H. W. Pfiffner. May 5th.

9,791. "Improvements in prepayment electrical house meters." R. H. White. May 5th.

9,800. "Electro-magnetic sound-recording apparatus." C. L. Chisholm. May 5th. (Complete.)

9,803. "Improvements in or relating to telephonic numbers, address and other messages indexing." E. Norvall. May 6th.

9,809. "Improvements in electric arc lamps." J. H. Dolton and S. E. Smith. May 6th.

9,832. "Improvements in safety fuses for switchboards." E. Peters. May 6th. (Complete.)

9,836. "Improvements in electro-galvanising." The Cowper-Coles Galvanising Syndicate, Ltd., and S. O. Cowper-Coles. May 6th.

9,838. "Improved regulatable inductive resistance." C. Meyer. May 6th. (Complete.)

9,844. "Improvements in or relating to automatic cut-out apparatus for electrical circuits." Felten & Guilleaume-Lahmeyerwerke Akt.-Ges. (Date applied for under Sec. 91 of the Act, May 6th, 1907, being date of application in Germany.) May 6th. (Complete.)

9,849. "Improvements in or relating to electric signalling systems for railroads and the like." A. J. Boult. (Union Switch and Signal Co., United States.) May 6th. (Complete.)

9,850. "Improvements in or relating to electric signalling systems for railways and the like." A. J. Boult. (Union Switch and Signal Co., United States.) May 6th. (Complete.)

9,851. "Improvements in or relating to electric signalling systems for railways and the like." A. J. Boult. (Union Switch and Signal Co., United States.) May 6th. (Complete.)

9,859. "Improvements in and relating to starting devices for electric motors." M. Kallmann. (Date applied for under Sec. 91 of the Act, October 28th, 1907, being date of application in Germany.) May 6th. (Complete.)

9,862. "Improvements in electric arc lamps." W. J. Davy. May 6th.

9,865. "Switch-plate for the aerial wires of electric tramways." A. G. Boon. May 6th. (Complete.)

9,876. "Improved variable speed gear for electric automobiles." C. M. de Sainte-Claire. (Date applied for under Sec. 91 of the Act, November 7th, 1907, being date of application in France.) May 6th. (Complete.)

9,900. "Improvements in electric batteries." F. Richmond. May 7th.

9,915. "Improvements in connectors for electric conductors." A. Powell. May 7th.

9,917. "Improvements in timed contact devices." I. H. Parsons and A. E. J. Ball. May 7th.

9,930. "Portable interrupter for induction coils and distributors of electrical current." A. E. Dean. May 7th.

9,972. "Improvements in and relating to the method of and means employed for increasing or decreasing the light given by arc or incandescent electric lamps for theatrical and analogous purposes." L. Sunderland and G. C. Pillinger. May 7th.

9,977. "Improvements in and relating to electrical power transmission systems." Allgemeine Elektricitats Gesellschaft. (Date applied for under Sec. 91 of the Act, June 8th, 1907, being date of application in Germany.) May 7th. (Complete.)

10,019. "Improved apparatus for producing electrical impulse charges for use in wireless telegraphy." S. Eisenstein. May 8th. (Complete.)

10,0 3. "Improvements relating to condensers of the Leyden jar type." S. Eisenstein. May 8th. (Complete.)

10,037. "Improvements in or relating to accumulators or secondary batteries." A. J. Boult (Schlesische Akkumulatoren Werke A.G., Austria). May 8th. (Complete.)

10,041. "Dry cell with ventilating channel." A. Schneeweis. (Date applied for under Sec. 91 of the Act, May 8th, 1907, being date of application in Germany.) May 8:h. (Complete.)

10,078 "Improvements in or relating to electrical storage batteries." A. W. Somers and R. J. Crowley. May 9th.

10,098. "Improved filament for electric glow lamps." J. W. Ward and R. H. Stevens. May 9th.

10,109. "Improvements in or relating to emergency brake systems for electric railways and tramways." W. H. Turner. May 9th.

10,118. "Improvements in and relating to electrical railways, tramways, and the like." C. von Gizinsky, W. McClure and E. Wiesner. May 9th. (Complete.)

10,121. "Improvements in and relating to dynamo-electric machines of the commutator type." Allgemeine Elektricitats Ges. (Date applied for under Sec. 91 of the Act, September 30th, 1907, being date of application in Germany.) May 8th. (Complete.)

10,128. "Improvements in electric portable lamps." J. Bein. May 9th.

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1907.

Arc Lamps. W. G. Heys. (The Scott Electrical Co., United States.) 17,655. August 2nd.

Space Telegraphy. J. S. Stone. 17,686. August 2nd. (Date applied for under International Convention, August 3rd, 1906.)

Inverted Repulsion Electric Motors. Felten & Guilleaume Lahmeyerwerke Akt.-Ges. 18,045. August 8th.

Diaphragms or Tympans for Phonographic and Telephonic Apparatus. J. G. Coombs. 21,087. September 23rd.

Detector for Wireless Telegraphy. W. P. Thompson. (Ges. für Drahtlose Telegraphie, Germany.) 21,408. September 26th.

Controlling Locks for the Well-Doors of Electric Lifts. J. C. Etchells. 22,259. October 9th.

Electric Switches or Controllers. J. C. Etchells. 22,349. October 10th.

Dynamo-Electric Machines. L. E. Underwood and C. P. Smith. 23,709. October 26th. (Date applied for under International Convention, October 27th, 1906.)

Electric Fans. F. Diehl and A. F. Becker. 23,756. October 28th. (Date applied for under International Convention, April 22nd, 1907.)

Electrical Indicating or Recording Targets. J. Y. Johnson. (Felten and Guilleaume Lahmeyerwerke Akt.-Ges., Germany.) 24,213. November 1st.

Automatic Electrical Fire Alarm Systems. O. Rennert. 24,702. November 7th.

Bathing Tubs for the Treatment of the Human Body by the Application of Electric Currents. F. Braun. 25,187. November 13th.

System of Radio-Telephony. Ges. für Drahtlose Telegraphie. 26,530. November 30th. (Date applied for under International Convention, December 19th, 1906.)

Process and Apparatus for Electrically Fusing, Refining and Moulding Refractory Substances such as Quartz. J. W. Mackenzie. (L. Bolle and Co., Ges., Germany.) 5,764. March 9th.

Single-Phase Alternating-Current Motors. W. Cramp. 6,034. March 13th.

Electric Switches. C. A. Vandervell. 8,376. April 10th.

Electric Alarm Bells. N. Kessler and G. Jelich. 8,471. April 11th.

Multiple Switch Controlling Apparatus for Electric Circuits, Specially Applicable to Motor Starters. P. S. Brook and J. A. Hirst. 8,504. April 12th.

Means of Propulsion of Electrically-Driven Trains and the like. S. Stone and L. W. Migotti. 8,623a. April 13th. (Date applied for under Rule 13, April 13th, 1907.)

Controlling Devices for Electrical Machines. D. Balschowsky and P. Caire. 9,157. April 19th.